December 2010

CMAST 1.2

User Manual

© 2010 National Fenestration Rating Council, Inc.

All rights reserved. No parts of this work may be reproduced in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems - without the written permission of the publisher.

Products that are referred to in this document may be either trademarks and/or registered trademarks of the respective owners. The publisher and the author make no claim to these trademarks.

While every precaution has been taken in the preparation of this document, the publisher and the author assume no responsibility for errors or omissions, or for damages resulting from the use of information contained in this document or from the use of programs and source code that may accompany it. In no event shall the publisher and the author be liable for any loss of profit or any other commercial damage caused or alleged to have been caused directly or indirectly by this document.

Table of Contents

Section 1 Introduction 5

1.1 Overview 5
1.2 Program Features 5

Section 2 Installation 7

2.1 Client PC Requirements 7
2.2 Installation Instructions 7

Section 3 Program Description 11

3.1 Authentication and Login Procedure 11
3.2 Program Overview 12
3.2.1 Main Menu 15
3.2.1.1 User Menu 15
3.2.1.2 Projects Menu 16
3.2.1.3 Products Menu 16
3.2.1.4 Assemblies Menu 16
3.2.1.5 Components Menu 17
3.2.1.6 Options Menu 18
3.2.1.7 Help Menu 18
3.2.2 Toolbar 19
3.2.3 Recent Projects 19
3.2.4 CMAST Options 20
3.3 Synchronization and Import in CMAST 21
3.3.1 Data Visibility 21
3.3.2 Synchronization 24
3.3.3 Import From Server 26
3.3.4 Submit 28
3.4 Process of Projects and Label Certificates Generation 29
3.5 Component Libraries 30
3.5.1 Search Functionality 30
3.5.2 Glazing Layer Components 31
3.5.2.1 Glazing Layer Import From Optics 33
3.5.3 Frame Components 36
3.5.3.1 Frame Component Screen 37
3.5.3.2 Frame Grouping 40
3.5.4 Spacer Components 41
3.5.4.1 Spacer Component Approval Paths 42
3.5.4.2 Spacer Component Screen 46

© 2010 National Fenestration Rating Council, Inc.

3.5.4.3 Spacer Component - Path I definition 46
3.5.4.4 Spacer Component - Path II definition 47
3.5.4.5 Spacer Component - Path III definition 50
3.5.5 Gas Components 52
3.5.5.1 Pure Gas Screen 52
3.5.5.2 Gas Mixture Screen 53
3.6 Assemblies 54
3.6.1 Center of Glazing Assemblies 54
3.6.1.1 Center of Glazing Assembly Screen 56
3.6.2 Frame Assemblies 57
3.6.2.1 Frame Assembly Screen 58
3.6.2.2 Custom Frame Assembly 64
3.6.2.3 Combination Frame Assembly 68
3.6.2.4 Composite Frame Assembly 71
3.6.3 Spacer Edge Seal Assemblies 75
3.6.3.1 Spacer Edge Seal Assembly Screen 76
3.7 Products 81
3.7.1 Product Screen 82
3.7.2 Baseline Product 87
3.8 Framing Product Lines 88
3.8.1 Framing Product Line Screen 89
3.9 Projects 90
3.9.1 Project Screen 92
3.9.1.1 Project Information section 93
3.9.1.2 Products section 94
3.10 Bid Report 95
3.11 Label Certificate 97

Section 4 Web Portal 99

4.1 Login Page 99
4.2 Login Troubleshooting 100
4.3 Home Page 100
4.4 Users 102
4.4.1 User Registration 102
4.4.2 User Details 103
4.4.3 User Roles 106
4.5 Companies 107
4.5.1 Company Registration 107
4.5.2 Company Details 109
4.6 Menu System 110
4.6.1 Menu Home 111
4.6.2 Menu Switch Units 111

© 2010 National Fenestration Rating Council, Inc.

4.6.3 Menu Find 111
4.6.4 Menu New 113
4.6.5 Menu Help 113
4.6.6 Menu Logout 114
4.7 Component Libraries 114
4.7.1 Glazing Component 114
4.7.2 Frame Component 115
4.7.3 Spacer Component 117
4.8 Framing Product Lines 119
4.9 Products 120
4.9.1 Product 120
4.9.2 Validation Test Report 122
4.10 Label Certificates 124
4.11 Payment and Billing 127
4.11.1 Types of CMA Fees 127
4.11.2 Company Billing Pages 129
4.11.3 Payment Process 131

Section 5 Appendix A: Addendum to THERM 6 User's Manual 136

Section 6 Appendix B: Addendum for Accredited Simulation Laboratories (ASL) 148

6.1 Accredited Simulation Laboratory (ASL) Process 149

Section 7 Appendix C: Addendum for ACE 151

7.1 Approved Calculation Entity (ACE) Process 152

© 2010 National Fenestration Rating Council, Inc.

1. Introduction

1.1 Overview

CMAST (Component Modeling Approach Software Tool) is a sophisticated information system, consisting of a MS Windows client computer program (CMAST Client), server database (CMAST Database) and web portal (CMAST Web). CMAST is used for the certification and rating of Non-Residential fenestration products using novel Component Modeling Approach methodology (CMA). CMAST client program is used by component manufacturers, Accredited Simulation Laboratories (ASLs), Approved Calculation Entities (ACEs), Certification and Inspection Agencies (IAs), NFRC staff; and general users. Each user is assigned a role, with General User role being the default and other roles being assigned by NFRC, depending on the level of qualifications, company affiliation and granted licenses by NFRC. Depending on their roles, users will have access to certain CMAST program functions and will have the ability to perform corresponding tasks related to components, assemblies, products and projects.

Also, the CMAST client application allows users to work offline by storing all relevant information in the local (client) database, so that they can create new components, assemblies, products and projects, as well as edit/delete existing components, assemblies, products and projects, which have not been approved/certified yet, or have not been synchronized with server database. In order to submit new components for review and approval, submit projects for bid proposals or label certificates, or synchronize client database with server database, client PC needs to be online.

1.2 Program Features

Main CMAST features are:

- Importing frame and spacer components from THERM 6 program,
- Importing laminates and applied films from OPTICS 5,
- Resizing of spacer components,
- Submitting frame and spacer components for review and approval,
- Submitting Laminates and Applied Films for review and approval,
- Creation of frame, spacer edge-seal and center-of-glazing assemblies,
- Calculation of performance of center of glazing assembly (optical and thermal)

© 2010 National Fenestration Rating Council, Inc.

- Changing sealant material and sizes in spacer edge-seal assemblies
- Calculation of performance of spacer edge-seal assemblies (thermal)
- Definition of products and calculation of their thermal and optical indices (U-factor, SHGC and VT);
- Definition of projects;
- Submittal of projects for bid reports and label certificates.

© 2010 National Fenestration Rating Council, Inc.

2. Installation

2.1 Client PC Requirements

Client PC computer system should meet these specifications:

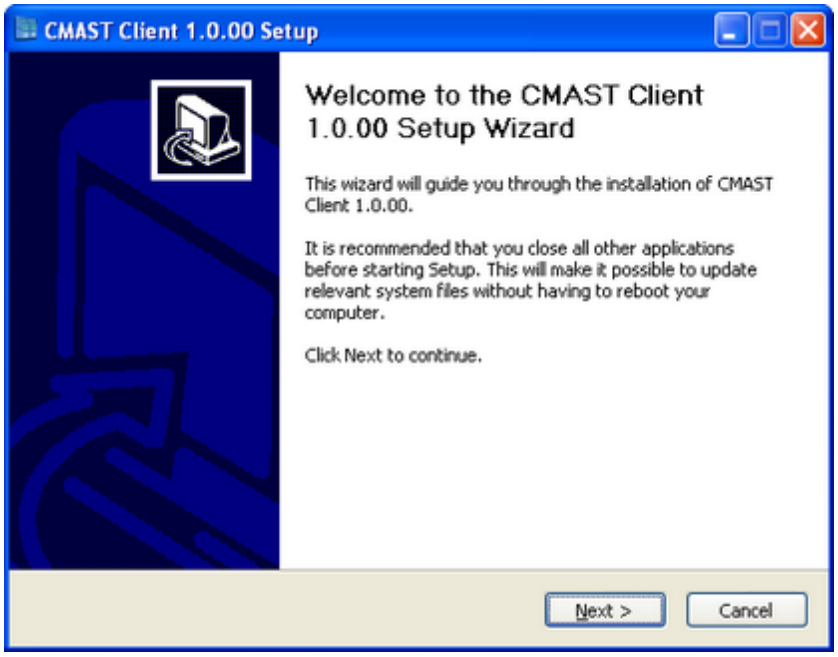
- Minimum configuration: 1 GHz or faster processor and 512 MB memory. Intel Core Duo / AMD Opteron or faster processor recommended for optimal performance.
- For optimal operation, 2 GB of random access memory (RAM) or more is preferable.
- Microsoft Windows 2000 Professional with Service Pack 4 or later; Microsoft Windows 2000 Server with Service Pack 4 or later; Windows XP with Service Pack 2 or later; Windows Server 2003 Standard, Enterprise, or Datacenter editions with Service Pack 1 or later; Windows Server 2003 Web Edition SP1; Windows Small Business Server 2003 with Service Pack 1 or later; or Windows Vista Home Basic and above operating system.
- Hard disk drive with 10 GB or more of available space is recommended for optimal performance.
- XGA (1,024x768) or higher-resolution video adapter and monitor.
- WINDOW 6.3.9 program; THERM 6.3.19 program; Microsoft Internet Explorer 6.0 SP1 or later, or Mozilla Firefox 2.0 or later.

2.2 Installation Instructions

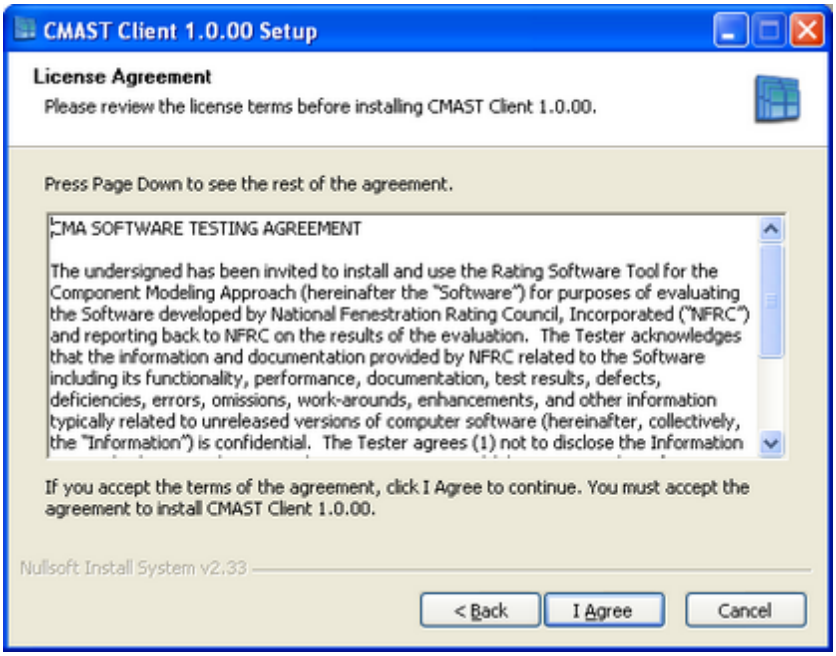
In order to install CMAST client application, following steps need to be taken:

1. Run CMASTClientSetup.exe.
2. The **Welcome** window will appear first. Click the **Next** button to continue with the installation, or cancel it by clicking the **Cancel** button.

© 2010 National Fenestration Rating Council, Inc.

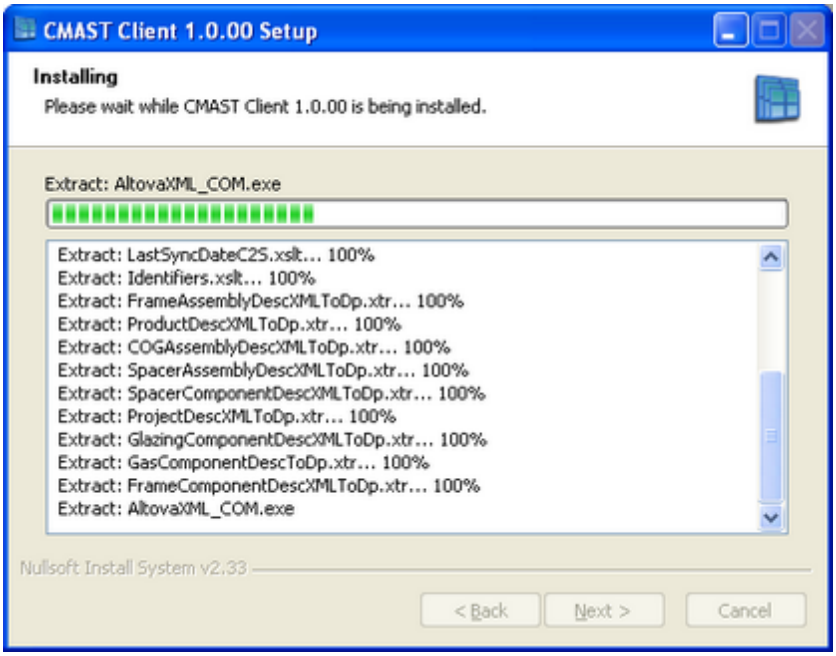


3. The **License Agreement** window is displayed next. You must agree to the terms of the license to continue with the installation.

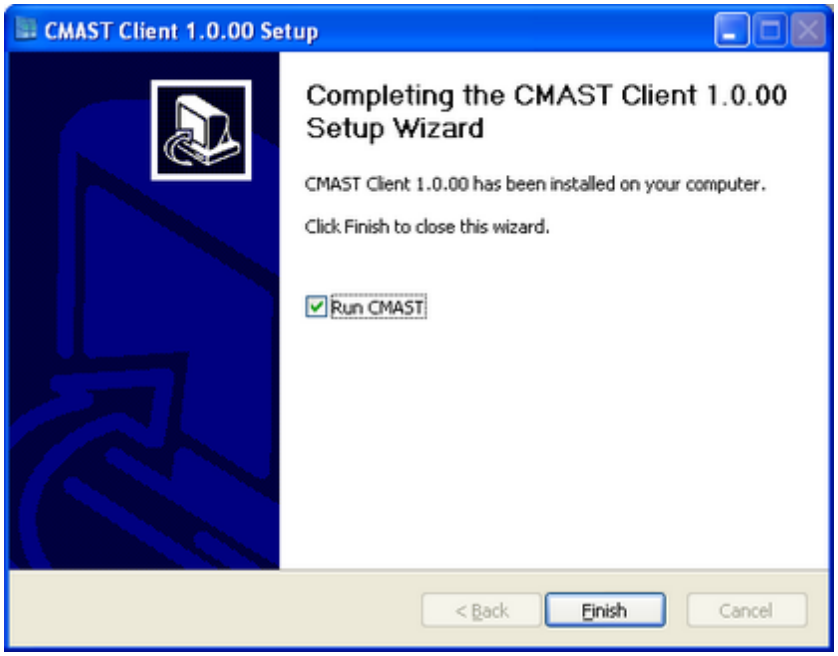


4. When the previous steps are completed, CMAST client installation starts. The **Installing** window will appear and show bars with the installation status.

© 2010 National Fenestration Rating Council, Inc.



5. When CMAST is successfully installed, the final installation window will appear.



6. CMAST icon will be automatically put in the Programs menu, accessible from the Start button.

WINDOW 6.3.9 and and THERM 6.3.19 (downloadable from http://windows.lbl.gov/software/window/6/index.html and http://windows.lbl.gov/software/therm/6/index.html) also need to be installed. Please note both applications should be installed in default

© 2010 National Fenestration Rating Council, Inc.

directories offered during installation. If being already installed in some other directories, they need to be de-installed first, and then installed in the default ones. The order of installation is not important, but when CMAST is run for the first time, all three programs should be installed for proper operation.

If communication between CMAST client application and staging server does not work, then access to port 49333 on the staging server needs to be enabled. For more details please contact your IT personnel, or our support team.

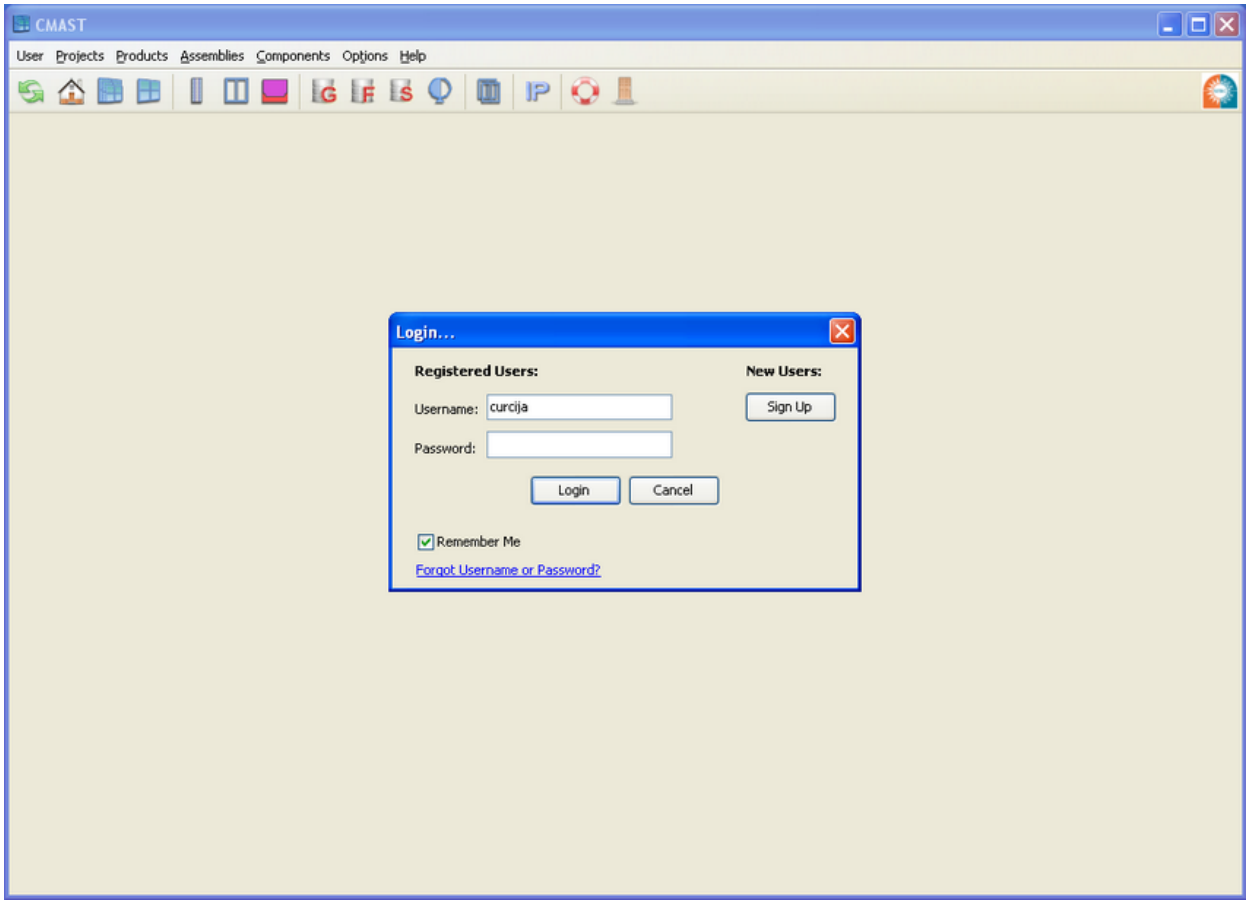
CMAST development team issues occasional patches and updates. They are posted on the CMAST web site (cmast.nfrc.org) and should be installed for proper operation of the program. In order to access installation files user needs to be logged in first. If the proper version of the program is not installed, CMAST will reject attempt to synchronize client in order to protect the integrity of the data on the server. If newer version needs to be installed, CMAST needs to be shut down and proceed with installing the update. Before any update can be installed, full base version needs to be installed first. For example, in order to install version 1.1.07, full version CMASTClientv1_1_02Setup.exe needs to be installed first, followed by CMAST_Clientv1_1_07Update.exe.

© 2010 National Fenestration Rating Council, Inc.

3. Program Description

3.1 Authentication and Login Procedure

Each time CMAST client application is started, users need to log-in in order to perform authentication before the program can be used. After login, CMAST checks user roles in order to allow access to certain program functions and data in the database.



When user is logging-in for the first time after installation of CMAST client application, client PC must be online, so that authentication can be done by connecting to CMAST server and retrieving user information and assigned roles, as well as user's company roles. That information is stored on local (client) PC, which allows the user to run the client application offline in the future.

Login dialog-box will automatically fill in Username if "Remember Me" box is checked. If user misplaces or forgets Password or Username, it can retrieve it by clicking on "Forgot Username or Password" link. This link brings users to the web page where they can request password to be reset. Also, there is Sign Up button in the upper right corner of the screen, for new users, which will also take a user to the web page where they can register.

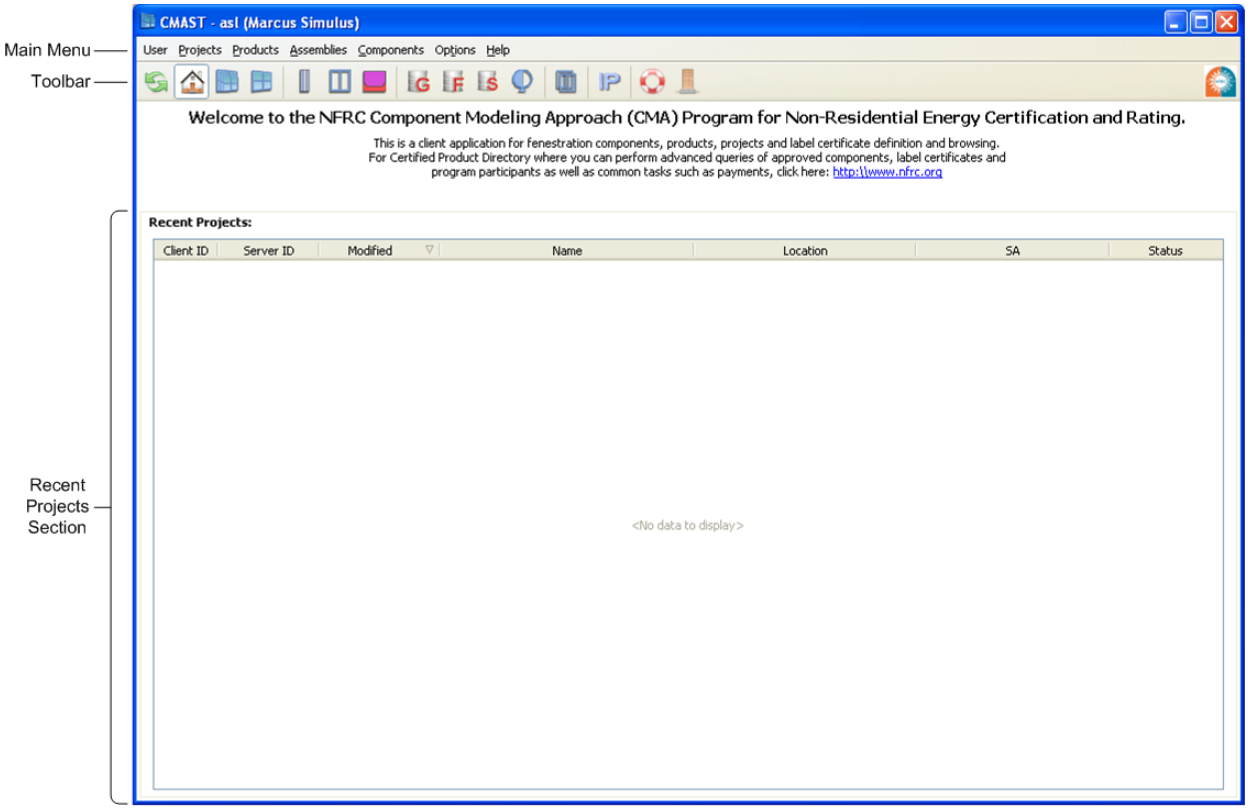
© 2010 National Fenestration Rating Council, Inc.

3.2 Program Overview

Main screen of the CMAST client application provides handy access to all program options and it consists of three major areas:

- Main Menu
- Toolbar
- Recent Projects

In addition to the main screen, other program screens allow performing component, assembly, product and project-related tasks. Please note that if "Access Violation" error occurs during the work, the CMAST client application should be closed and re-opened in order to avoid further erratic program behaviour and possible crashing.



It is recommended to perform full synchronization when the program is installed for the first time or is updated with the new version. Subsequent synchronizations are recommended when the program is started and before logout.

Procedural Steps:

CMA stands for component modeling approach, where fenestration components represent

© 2010 National Fenestration Rating Council, Inc.

fundamental building blocks of fenestration products that are assembled in CMAST. Assembly of products is done in much the same way that manufacturer would assemble products from components on a production floor. Glazing and spacer components are assembled in insulated glazing units (IGU), by assembling "center of glazing assemblies" (COGA) and "spacer-edge-seal assemblies" (SESA) first. COGA consists of glazing components (GC) and gas fill, where gas fill can be either pure gas or gas mix. SESA is assembled from spacer components (SC) and selection of sealants. Frame components (FC) are assembled into frame assemblies, determined by the product layout (e.g., Fixed, Casement, Horizontal Slider, etc.) and placement of individual FCs in the product layout (e.g., sill, jamb, head, meeting rail, etc.). Whole products are assembled from frame assemblies, COGA and SESA and some additional information, such as Framing Product Line (FPL), Name, Description and Notes. In the final stage, projects are defined by adding products to the project and defining some common information such as project address, name of the contact person, etc. For each product, actual product size can be set and number of units with that size in a project.

Therefore, the following is the sequence of steps that needs to be taken in CMAST. Please note that components and assemblies, particularly approved components and certified products may already be available, in which case those steps can be skipped.

- **Define framing product line (FPL)**. FPL includes definition of the manufacturer and inspection agency, which are required fields for certified products and label certificates. FPL itself is a requirement for certified products and label certificates, but it is optional for design mode.
- **Define any gas mixes** that will be used in center of glazing assemblies (COGA). 10% Air/90% Argon mix is predefined and does not have to be defined again.
- **Define frame components (FC)**. Most important information for FCs come from THERM 6 files (important information from the THERM 6 file is imported into CMAST, but not THERM 6 file itself). The remaining information is entered into appropriate fields. For certified products and label certificates, this step needs to be done by a simulator in responsible charge (SIRC), who is an employee of the accredited simulation laboratory (ASL). When project is submitted for label certificate, CMAST checks if all of the constituent components are in "Approved" status. In order for frame components to be in approved status, SIRC needs to submit FC for review by an IA. IA approves FCs, after it performs review of the THERM files and simulation report (procedure defined in NFRC Laboratory Accreditation Program or LAP) and performs review of the testing validation for the Framing Product Line (FPL). For design mode, any user can define FCs and use them in non-certified products and bid reports.
- **Define spacer components (SC)**. Just as with FCs, most important information for SCs come from the THERM 6 file, which is imported into the CMAST. The remaining information is entered into appropriate fields. As opposed to FCs, THERM files are stored in CMAST and are used for resize and spacer edge-seal assembly (SESA) generation. For certified products and label certificates, this step needs to be done by a SIRC, employed by ASL, in much the same way as with FCs. However, approval of SCs is not dependent on the testing validation and is

© 2010 National Fenestration Rating Council, Inc.

done based on THERM files and simulation reports. For design mode, any user can define SCs and use them in non-certified products and bid reports.

- **Define Glazing Components (GC)**. Vast majority of glazing components are defined through the International Glazing Database (IGDB) approval process, which is done outside of CMAST. CMAST contains full IGDB with the exception of un-approved components (i.e., components without pound sign), and is regularly updated by NFRC Staff and synchronized to all clients through the client synchronization process. Smaller number of glazing components are defined in OPTICS (some applied films and some laminates). This is done by SIRC for glazing components submitted for review and approval, and by any user for glazing components in design mode, which are not used in certified products and label certificates.
- **Define frame assemblies (FA)**. Frame assemblies are defined by selecting framing product line (required for FA used in certified products and label certificates, and optional for design mode), fenestration product type (required in all cases), either from the list of NFRC approved product types (simple products), or from the list of Non-approved product types (complex products). After the selection of product type, its layout appears in the graphical portion of the screen (configurator), and user needs to select specific FC for each frame member. The definition of the FA is completed by entering common information, such as Name, description, etc.
- **Define Spacer-Edge Seal Assemblies (SESA)**. Spacer edge-seal assemblies are used in insulated glazing units (IGU) and consist of spacer component and appropriate sealants, depending on the configuration and/or chosen path (see section on spacer components for details). Besides the selection of SC and sealants, the definition of SESA is completed by entering common information, such as Name, description, etc.
- **Define Center of Glazing Assembly (COGA)**. Center of glazing assembly is other constituent in IGUs, along with SESA. For COGA number of glazing layers is defined; for each glazing layer glazing component (GC) is selected; and for each gap in-between glazing layers, gas fill is selected (pure gases or gas mixes). The definition of COGA is completed by entering common information, such as Name, description, glazing supplier, etc.
- **Define Products (P)**. Products are generated by electing frame assembly first and then COGA and SESA (in that order, since COGA list is filtered by the glazing pocket width in FC, and SESA list is filtered by the width of gap spaces in COGA). The definition of product is completed by entering common information, such as Name, description, etc. Products that are included in any of the label certificates have certified status.
- **Define Projects (PJ)**. Projects are used for label certificates, or for bid reports. They are collection of products (certified or design), where user can set size and number of units for each product. Projects can be submitted for label certificates only by an approved calculation entity (ACE), working for licensed ACE

© 2010 National Fenestration Rating Council, Inc.

Organization. Projects are reviewed by an IA for the completeness and accuracy of information. Once certified, specifying authority needs to sign license agreement, pay appropriate fees and such label certificate becomes accessible on the web portal to all registered users.

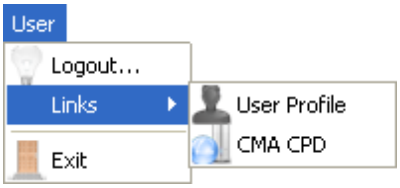
While the above section provided procedural steps, detailed information about each of the component and assembly, as well as about products and projects, is provided later on in this user's manual.

3.2.1 Main Menu

CMAST main menu, shown below, offers the following choices: User, Projects, Products, Assemblies, Components, Options and Help. Each of these menus can be accessed with mouse by clicking on the menu choice, which will provide additional sub-menu items from where user can gain access to all important CMAST functionalities and screens.

3.2.1.1 User Menu

The **User** menu can be used for performing login/logout operation, accessing user profile information and Certified Product Directory on the web, and closing CMAST client application.



The menu options are:

Logout/Login

When user is logged-in, the Logout option is available in the menu. By clicking on it user is logged-out, the main screen is reset to a blank screen, and the Login dialog-box is displayed. If the **Cancel** button is pressed on the Login dialog-box, the Login option becomes active in the menu and it can be used for opening the Login dialog-box.

Links

Both links in this menu item lead to CMAST web portal where is possible to access user profile information and Certified Product Directory on the web.

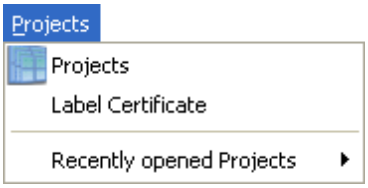
Exit

This option closes the CMAST client application.

© 2010 National Fenestration Rating Council, Inc.

3.2.1.2 Projects Menu

CMAST program options accessible from the **Projects** menu are intended for opening Projects screen, displaying list of label certificates for user, as well as for accessing most recently opened projects.



These options are:

Projects

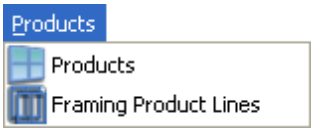
This option displays Projects screen containing list of existing projects from the CMAST client database.

Recently opened Projects

This menu item list most recently opened projects, giving possibility to quickly review them.

3.2.1.3 Products Menu

This menu has options for opening Products and Framing Product Lines list screens.



These options are:

Products

This option opens Products screen with list of the products in the CMAST client database.

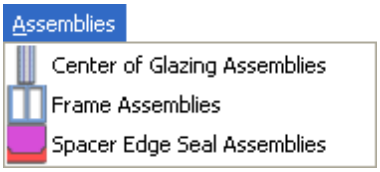
Framing Product Lines

Clicking on this menu item invokes the Framing Product Lines screen with list of all framing product lines in the program database.

3.2.1.4 Assemblies Menu

The **Assemblies** menu provides options for accessing center-of-glazing, frame and spacer edge seal assemblies screens.

© 2010 National Fenestration Rating Council, Inc.



The following are menu choices:

Center of Glazing Assemblies

This option opens Center of Glazing Assemblies screen where list of all glazing assemblies from CMAST client database is displayed in tabular manner.

Frame Assemblies

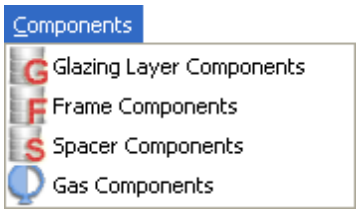
The Frame Assemblies screen is opened using this menu choice, listing all frame assemblies in CMAST client database.

Spacer Edge Seal Assemblies

By selecting this choice, the Spacer Edge Seal Assemblies screen can be accessed, and it presents tabulated data about all spacer assemblies in CMAST client database.

3.2.1.5 Components Menu

Choices from this menu are used for accessing glazing, frame, spacer and gas component libraries, as well as material library.



These choices are:

Glazing Layer Components

This option opens Glazing Components screen with list of all glass types that exist in CMAST client database.

Frame Components

Opens Frame Components screen with list of all frame components in CMAST client database.

Spacer Components

Invokes Spacer Components screen with listed information about existing spacer components.

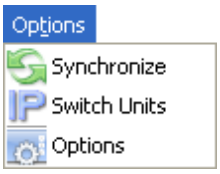
© 2010 National Fenestration Rating Council, Inc.

Gas Components

This option opens Gas Components screen with list of gasses (both pure and gas mixtures) from the CMAST client database.

3.2.1.6 Options Menu

The **Options** menu choices are intended for synchronization between CMAST client and server database, defining measurement units (SI or IP) and setting the CMAST program options.



The menu options are:

Synchronize

Clicking on this menu choice starts process of synchronization between CMAST client and server database.

Switch Units

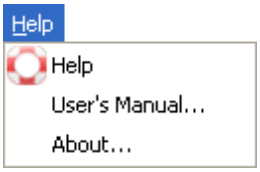
This option can be used to switch the units from IP (inch-pound, or also known as Imperial) to SI (System Internationale or also known as Metric) and vice versa from any screen where unit conversion is requested.

Options

This menu choice opens the CMAST Options screen with settings for important CMAST program options.

3.2.1.7 Help Menu

The **Help** menu can be used for accessing CMAST online Help system or user's manual, as well as for displaying general information about CMAST client application and its version.



The menu options are:

Help

© 2010 National Fenestration Rating Council, Inc.

This option provides access to the CMAST on-line help.

User's Manual

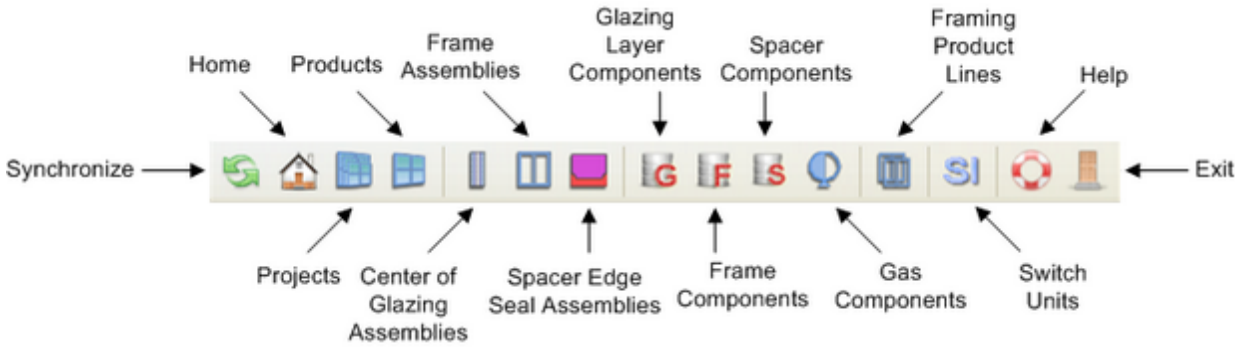
This option opens the program user's manual in PDF format.

About

This option displays splash screen with general information about CMAST client application, including program version.

3.2.2 Toolbar

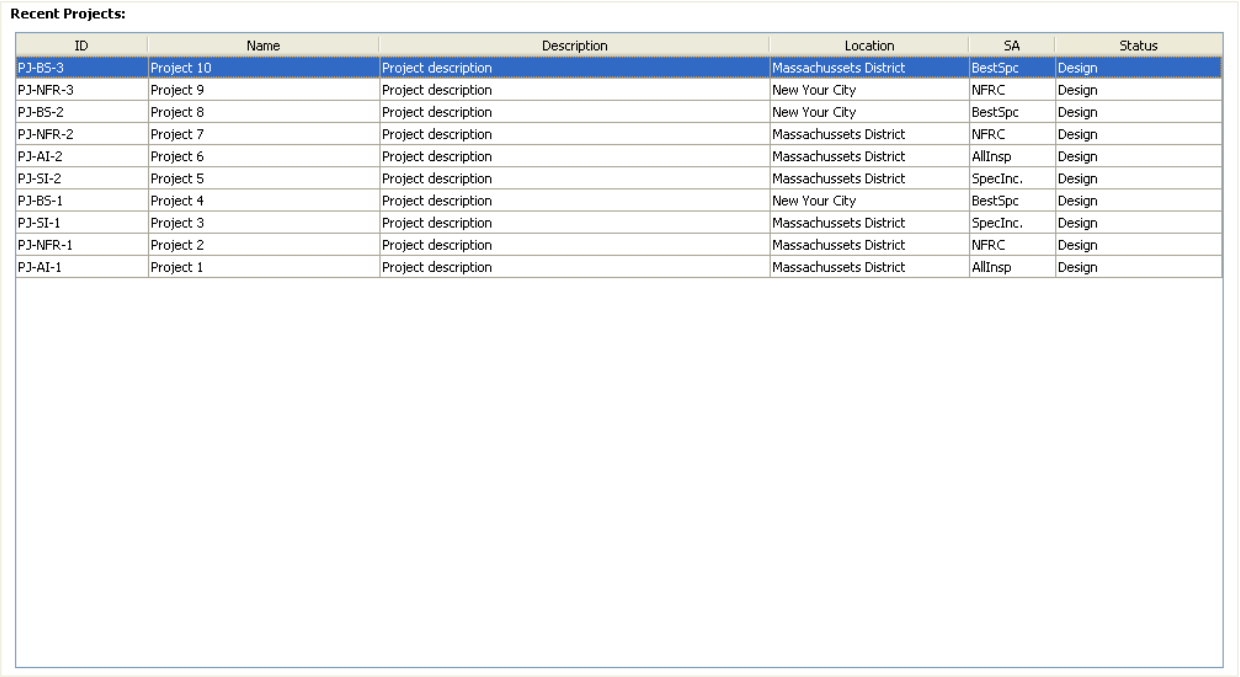
CMAST main screen toolbar contains buttons for quick access to most commonly used functions.



3.2.3 Recent Projects

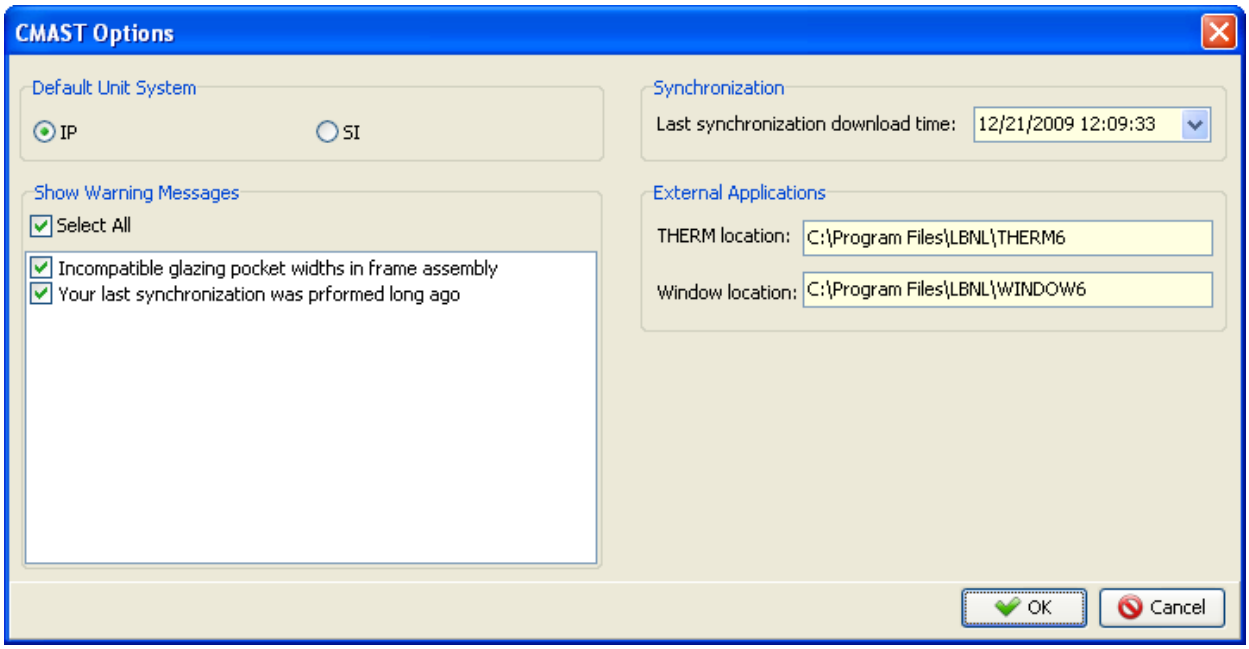
This part of the main screen presents list of recently accessed projects with tabulated information about them, and with possibility of sorting them by the grid column headings. Also, double click on each particular project will open Project screen, where detailed information about the project can be reviewed and/or edited.

© 2010 National Fenestration Rating Council, Inc.



3.2.4 CMAST Options

The CMAST Options screen can be opened by clicking on the **Options** function in the Options menu, and it consists of several sections with important CMAST client application settings. Note that all changes made in the program settings will be applied to the next program instances (i.e., next time CMAST client application is started).



© 2010 National Fenestration Rating Council, Inc.

The CMAST Options screen sections are:

Default Unit System

This setting defines default units system (IP or SI) that is used when the program is started.

Synchronization

Read-only information about last synchronization time for currently logged-in user is shown in this section.

Show Warning Messages

This setting allows selective display of switchable messages. If user clicks "Do not show this message again" on any of the switchable messages, it can turn the message back on by checking its box in this section.

External Applications

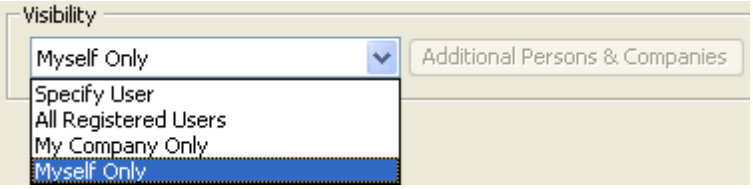
Read-only fields in this section display paths to THERM and WINDOW applications that must be installed for proper operation of the CMAST application.

3.3 Synchronization and Import in CMAST

3.3.1 Data Visibility

When creating a new component (glazing, frame and spacer), assembly (frame, glazing and spacer), product or project, or editing an existing one in the CMAST client application, user have possibility to specify its visibility, and in that way define audience that this item will be available to.

There are four different visibility types that can be defined in CMAST client application - Myself Only, All Registered Users, My Company Only and Specify User.



1. Myself Only

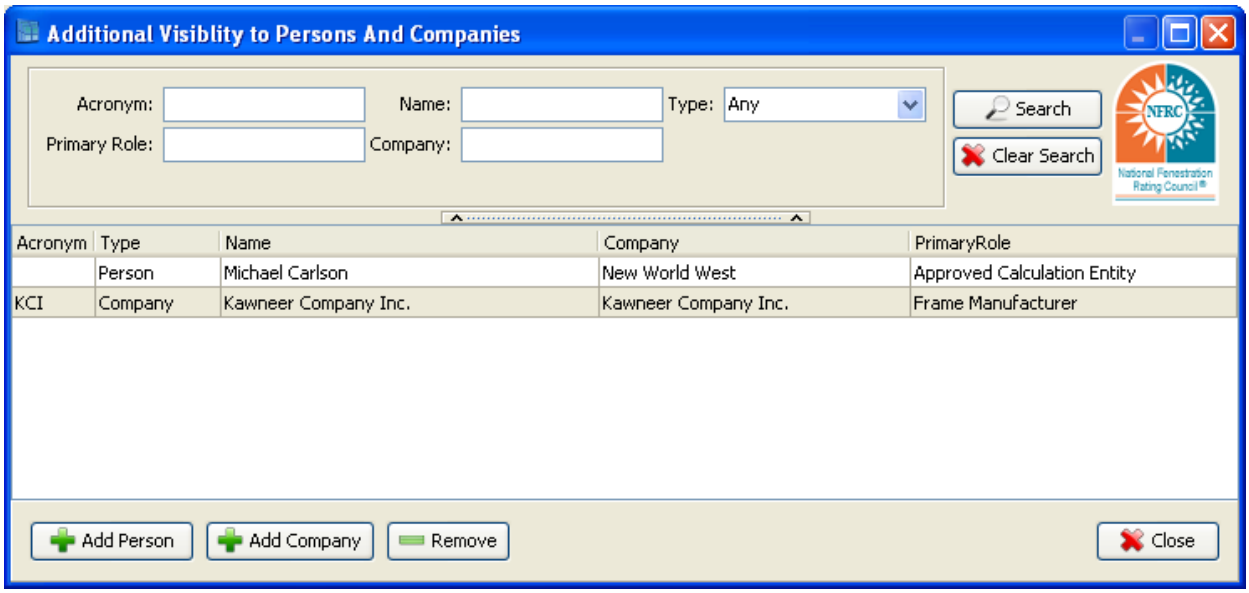
Myself Only visibility choice means that the item (i.e., component, assembly, etc.) can be edited only by the user who created it, and cannot be downloaded via synchronization or import by other users.

2. Specify User

When the Specify User visibility is set, list of persons and/or companies, which the item will be available to, needs to be selected from the screen opened using the **Additional**

© 2010 National Fenestration Rating Council, Inc.

Persons & Companies button. When specific persons are selected, the item will become available to them only, while the company selection makes it available to all users from the company. The items with Specify User visibility that are uploaded to server cannot be downloaded via synchronization, but only imported from server into the CMAST client database by specified user(s). After the item is imported, intended audience have possibility to edit it.



3. My Company Only

Items with the My Company Only visibility are downloaded via synchronization to all users from the same company as the person who originally created them. With "My Company Only" visibility, users from the same company do not import those items, because they are automatically synchronized to their client and the item is the original item, not a copy. Additional persons and companies, which the item will be available to, can be specified from the list opened using the button next to the **Visibility** drop-down list. They can be added by clicking on corresponding buttons (i.e. **Add Person** and **Add Company**) and selecting desired choice(s).

When specific persons are selected, the item (component, assembly, etc.) becomes additionally available to them, and if the company is selected, availability is extended to all users from that company. After uploading an item with My Company Only visibility and specified Additional Persons & Companies to server, it can be downloaded via synchronization to all users from the same company as the person who originally created it. At the same time, specified additional users can only import it from server.

Unlike items with other types of visibility, an item with "My Company Only" visibility can be edited by all users who belong to the same company as the user who originally created this item. Also, if two employees of the same company use one CMAST client application on one PC, all items "My Company Only" visibility imported by one of them automatically become available to the other user, too.

In this way, several CMAST users from the same company can have access to the same

© 2010 National Fenestration Rating Council, Inc.

item, and the following situations may occur when one user initiates synchronization:

a. User has made some changes in the item since the last synchronization, and no one else has made changes in the same period. Updated item will be uploaded to the server and will be updated in the server database.

b. User did not make any changes on this item since the last synchronization, but another user from the same company made some changes and did synchronization with the server. In this case, changes made by another user will be downloaded and local entity will be updated.

c. User has made the changes since the last synchronization, but another user has also made some changes and uploaded the item to the server in the meantime. In this case, updated item from the server will be downloaded, overwriting user's local changes.

It should be also noted that changing visibility of the item between Myself Only, My Company, All Registered Users and Specify Users affects only visibility and availability of the item to other users to import. Since importing an item results in a separate copy of that item on client PC, these changes do not affect already imported items. However, in case of "My Company Only" visibility there are consequences of changing it to some other visibility, which is explained in the following example.

Example:

User A creates an item, sets its visibility to My Company only and uploads it to the server via synchronization. User B, from the same company as user A, receives this item – also via synchronization (note that such object will NOT be available for import to user B, because it is synchronized automatically). If user A changes visibility of the item to something else, this change will be propagated to user B (and all other users form the same company) during next synchronization. This may result in some unexpected results, such as disappearance of items that were created by a particular user (e.g., if user B changes visibility to "Myself Only" user A, who created item will not be able to see it any longer).

4. All Registered Users

Items with the All Registered Users visibility are available to each registered CMAST user. Users from the same company as the person who originally created these items will download them via synchronization, while the other users can import them from server by using "Import from Server" functionality available on most list screens. After items with the All Registered Users visibility are downloaded via either synchronization or import, users have possibility to edit them.

After approval on the server, components get "Public" visibility, and become available to each registered CMAST user via synchronization. It is important to note that approved components become publicly available and synchronized to all clients regardless of their original visibility. For example, if the component was originally set with "Myself Only" visibility, but was later submitted for review to an IA and approved, once approved it receives public visibility and is automatically synchronized to all clients (after they perform synchronization). They are also available in CPD (public certified product directory, which

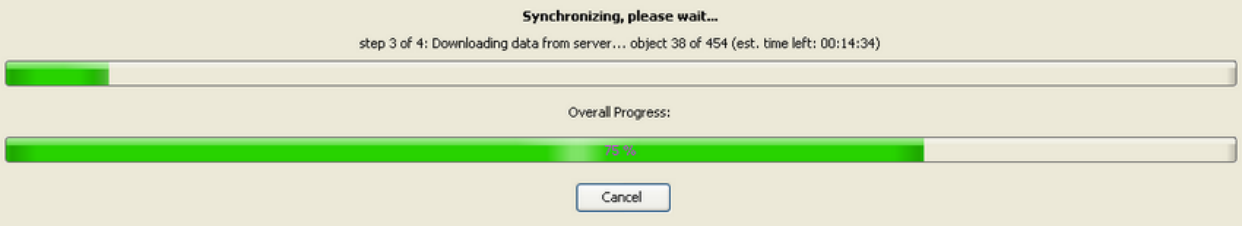
© 2010 National Fenestration Rating Council, Inc.

is accessible without the need to register or login).

Users from the same company as the person who created an item with All Registered Users or My Company Only visibility can modify it, but should not change its visibility to Specify User or Myself Only after downloading it via synchronization. In order to change visibility, it is necessary to create a copy of the item, set the visibility to Specify User or Myself Only and delete (deactivate) "original" item. Upon next synchronization, the new item will be uploaded to server, and also status of the "original" item will be updated in the server database to deleted (deactivated). This approach, also known as enforcement of the ownership assures that all users, which the item is made available to, work with "up-to-date" data, while disabling others from the same company from changing visibility that would remove the item from the owner's client (i.e., if somebody could change visibility to Myself Only, the original author would not have access to the item).

3.3.2 Synchronization

Synchronization is a process where newly created or updated items are exchanged between the CMAST server database and the client database. It can be started using either **Synchronize** option from the Options menu, or corresponding button in the CMAST main screen toolbar. Upon the process start, the CMAST main screen is temporarily reset to a blank screen with bars showing the synchronization status. User can not use other functionalities of CMAST while synchronization is in process.



The process consists of two steps, performed subsequently, which are based on the time the user last synchronized. Those two steps are downloading from and uploading to the server database. Note that both steps are performed in one synchronization action, which is transparent to the user. Both actions need to be completed in order for synchronization to be complete and user can get control of the client only after all synchronization steps are completed. Even though two major synchronization steps are outlined here, each step consist of intermediate steps, which are shown on the synchronization status screen.

1. Download from Server Database

Download from the server database is the first step during synchronization, and each registered user receives items from the server, which have been newly added or modified at the server database since the last synchronization for that user. Downloaded items vary for different users based on the following rules.

a. Each registered CMAST user will receive:

© 2010 National Fenestration Rating Council, Inc.

- approved and deactivated components - glazing, frame, and spacer;
- validated and deactivated framing product lines;
- frame, spacer, thermal break and product codes;
- materials;
- pure gasses;
- persons and companies.

b. Components that are not approved yet, assemblies (frame, center-of-glazing and spacer edge seal), as well as non-certified projects and products, designated with "All Registered Users" or “My Company Only” visibility are included in download only for users from the same company as the person who originally created these items. The same also applies to framing product lines that are not in "Validated" status, gas mixtures and certified projects and products.

In addition, status of items existing in the client database is updated upon synchronization, should items be approved, rejected, certified, or deactivated.

It should be also noted that items with "All Registered Users" visibility are automatically downloaded just for users from the same company as the person who originally created these items, while for other registered users will be available for import from server and will not be part of synchronization process.

2. Upload to Server Database

Upload to server database is the second step during the synchronization process. It includes items made or modified in the client database after the last synchronization was being performed. List of items for upload depends on their visibility, established by the person who created them, and it is based on the following rules.

a. Items that have visibility established for sharing with intended audience will be included in upload. These items are:

- Components (glazing, frame, and spacer);
- Assemblies (glazing, frame and spacer);
- Products
- Projects.

b. Framing product lines and gas mixtures are always included in upload.

It should be noted that each item is uploaded along with list of persons and/or companies that have been granted visibility (if applicable). When an item is successfully uploaded to the server, server returns information about the item Server ID (which may have been generated, or changed by the server), and corresponding record in client database is updated. Server ID is a unique identifier assigned to components, assemblies, products and projects, and when an item is created in the client application, Server ID is empty. It is assigned by the server application during initial upload of the item and updated in the client database. Afterwards, during next synchronization processes Server ID may be updated

© 2010 National Fenestration Rating Council, Inc.

accordingly, as it contains company acronym, which may be changed during the lifecycle of an item (e.g., if manufacturer of the item is changed).

In case of successful completion of the synchronization, time when the process started will be recorded as the last synchronization time, and will be used for next synchronization instance.

3.3.3 Import From Server

Importing from the server is one of main CMAST program features that allows a user to select items from the server database to download into the client database. All items that are included in synchronization for the current user are not included in the import from the server. Items that can be selected for import are:

1. Non-approved components (glazing, frame and spacer);
2. Assemblies (glazing, frame and spacer);
3. Non-certified products and projects.

Their inclusion in the import list is based on the following criteria:

a. Items that have visibility "Specify User", "All Registered Users", or "My Company Only" with specified Additional Persons & Companies, will be available in import for intended audience.
   - Items with "All Registered Users" visibility can be imported by all users that are registered.
   - Items with "Specify User" or "My Company Only" visibility with specified Additional Persons & Companies can be imported only by users specified in these lists.

b. Components (glazing, frame and spacer) submitted for review, baseline products submitted for framing product line validation and projects submitted for label certificate are available for import to all users from designated Inspection Agency (IA) company.

c. Framing product lines will be imported only with frame components or frame assemblies already included in import.

d. Gas mixtures will be imported only if being applied in center-of-glazing assemblies already included in import.

While viewing the list of available items for import, a user can see the details of an item from the list by selecting it and clicking on Details button. The item details can be reviewed only if all of its parts and/or referenced objects have appropriate visibility, so that they are available to the user. Otherwise, review of the item details is not allowed.

When user requests Import from Server for specific items they will be downloaded in a single action following the Import from Server execution (e.g., if user clicks on "Import from Server" button in the Spacer Edge-Seal Assembly (SESA) list screen, next screen will show the list of all available SESA for download. If user selects one or more SESA for

© 2010 National Fenestration Rating Council, Inc.

import and clicks "Select" button, those SESA will be imported into client as copies in one action of import and the control of the client will not be available while import is in process. Standard hourglass symbol is shown while import is ongoing and returns to standard mouse arrow after import is completed.

It should be noted that selected items are imported one by one, along with their parts and/ or referenced objects, if necessary. Also, for each of selected items, a check is made to determine if all of its parts and/or referenced objects have appropriate visibility, so that the user can import them. If any of objects referenced by the item for import (e.g., component in the assembly selected for import, or assembly in product selected for import, etc.) is not visible to the user in question, that particular item (selected by the user from Import list) will not be imported. The following example explains basic rules for import of an item along with its parts (referenced objects).

Example:

Last synchronization of User A was performed on May 10. On May 15 User A wants to import Frame Assembly X that consists of 6 frame members (frame components):

- *X1 is an approved component with "Public" visibility, and its last synchronization was performed on May 1;*
- *X2 is an approved component with "Public" visibility, and its last synchronization was performed on May 14;*
- *X3 is a component in "Design" status with "All Registered Users" visibility, and its last synchronization time is irrelevant;*
- *X4 is a component created by another user; it has "Design" status and "Myself Only" visibility; its last synchronization time is irrelevant;*
- *X5 is a component created by the user from the same company as user A; it has "Design" status and "My Company Only" visibility; its last synchronization was performed on May 5;*
- *X6 is a component created by the user from the same company as user A; it has "Design" status and "My Company Only" visibility; its last synchronization was performed on May 12.*

Based on the criteria for synchronization and import that are stated previously, import of the frame assembly and components that it consists of will be done as follows:

- *X1 will not be downloaded; as an approved component it was downloaded during synchronization of User A on May 10;*
- *X2 will be downloaded; it is an approved component, but it was changed after the last synchronization of User A on May 10;*
- *X3 will be downloaded; it is not an approved component and therefore not subject to synchronization;*
- *X4 will not be downloaded as it is not “directly visible” to User A; hence whole*

© 2010 National Fenestration Rating Council, Inc.

frame assembly import will be aborted;

- *X5 will not be downloaded; User A already got it through synchronization on May 10;*
- *X6 will be downloaded, as it was changed after the last synchronization of User A on May 10*.

After the import is performed, all of the received items are stored in the client database as copies. This means that their Server IDs are erased; new local (client) IDs are assigned; Visibility is set to default visibility (e.g., My Company Only); and the user who imported them takes their ownership.

3.3.4 Submit

Submit is a process when user sends certain items to server for further processing, and it includes:

1. Submit of components (e.g., glazing, frame and spacer) for approval;
2. Submit of Baseline Product (BLP) for validation of Framing Product Line (FPL);
3. Submit of projects for issuing Label Certificate.

Submit can be performed only if the user's credentials are verified and the item in question is valid for the submit.

Verification of user's credentials includes user's status and role, but also status and role of user's company. Submit of components for approval, as well as submit of BLP for FPL validation, can be done only by Simulator-In-Responsible-Charge (SIRC) working for ASL (accredited simulation laboratory). At the same time, submit of projects for Label Certificate issuing is done only by an Approved Calculation Entity (ACE). Therefore, if the user that tries to submit a frame component for approval is not "Approved" any longer, or its company no longer has ASL role, submit cannot be carried out.

Validity of items for submit means that components need to be completely defined; Baseline Product needs to satisfy criteria defined in the Baseline Product section; while the project must meet criteria defined in the Label Certificate section.

Upload to server during the submit process may involve not only item that is being submitted, but also its parts and/or referenced objects. For example, framing product line, assigned to the frame component intended for submit, may be uploaded to server during the frame component submit. Similarly, frame component(s) and/or frame assembly may be uploaded along with Baseline Product. In that case, all these objects are uploaded to the server one by one, and a check is made if all of these items included in upload are up to date with the data in server database. If that is not the case, a pop-up message is shown asking user to perform synchronization before attempting submit again.

© 2010 National Fenestration Rating Council, Inc.

3.4 Process of Projects and Label Certificates Generation

Project represents a collection of individual fenestration products specified for a building project. In order to generate the project, the following steps need to be performed in CMAST:

1. User needs to make sure that glazing, frame and spacer components are available for the products intended for addition in the project. Components that are not currently available need to be created, and order of their creation is not important.
   - **Glazing components** – in addition to glazing components from IGDB that are provided in the CMAST client database, simulator can create laminate and film layer in Optics per NFRC 303 and 304 if needed for a specific product(s) in a project, and afterwards import them data into CMAST, as described in the Glazing Layer Components section.
   - **Frame components** – frame component models are created in THERM 6, as described in the Appendix A section. Afterwards, user configures components in CMAST by importing corresponding THERM files, and this process is specified in the Frame Components section.
   - **Spacer components** – Path II and Path III spacer component models are created in THERM 6, as described in the Appendix A section. Then, spacer components are configured in CMAST, and the process of importing and defining spacer components is described in the Spacer Components section.
2. If not already available for a specific product(s) in the project, assemblies need to be created from corresponding components, and order of their creation is also not important.
   - **Gas mixtures** – user can create custom gas mixtures using pure gasses, as described in the Gas Mixtures section, if needed for specific center of glazing assemblies.
   - **Center of Glazing assemblies** – creation of the center of glazing assemblies using glazing components and pure gasses, or gas mixtures needs to be performed as described in the Center of Glazing Assemblies section.
   - **Frame assemblies** – in addition to standard product types, such as Casement, Fixed, Horizontal Slider, Vertical Slider, etc., it is also possible to create complex frame assemblies - Combination, Composite and Custom, from the frame components, as described in the Frame Assemblies section.
   - **Spacer Edge-Seal assemblies** – Path I and Path II spacer edge-seal assemblies are generated automatically from corresponding spacer components, while the Path III spacer edge-seal assemblies are created from the spacer components as explained in the Spacer Edge-Seal Assemblies section.
3. Products intended for addition in the project need to be created from the frame, spacer

© 2010 National Fenestration Rating Council, Inc.

edge-seal and center of glazing assemblies. Creation of the products is described in detail in the Products section. It should be noted that once the frame assembly is selected, available center of glazing assemblies are only those which thickness corresponds, within defined tolerance (i.e., **Width Tolerance** value that is defined for the frame component), to the glazing pocket width of the frame components that selected frame assembly consists of. After the center of glazing assembly selection, available spacer edge-seal assemblies are the ones which width corresponds to gap width of the chosen center of glazing assembly.

4. Next step is project creation, as explained in the Projects section, by starting a new project, specifying general project information, adding products and setting their dimensions and quantity in corresponding grid cells. Please note that any change of the product dimensions in grid cells will result in deletion of previously calculated product indices, and therefore re-calculation needs to be performed.

5. Once the project is completely defined, every registered user would be able to request a Bid Report, as explained in the Bid Report section. If all products in the project meet necessary criteria for obtaining Bid Report, it will be successfully created; otherwise user would be informed that the Bid Report cannot be created, and all products that do not meet criteria would be red-highlighted in the Products section, so that the user can further access each of these products in the Product screen in order to fix problems.

6. Only ACE user is able to request Label Certificate for completely defined project. In order to be successfully submitted for the label certificate, the project needs to satisfy the following criteria:
   - all products in the project must have valid results (i.e., whole product indices - U, SHGC and VT);
   - all components (e.g., glazing layer, frame and spacer) must be approved, and all assemblies and products must be made of these approved components;
   - all required information about the project (including Specifying Authority and Inspection Agency) must be defined.

3.5 Component Libraries

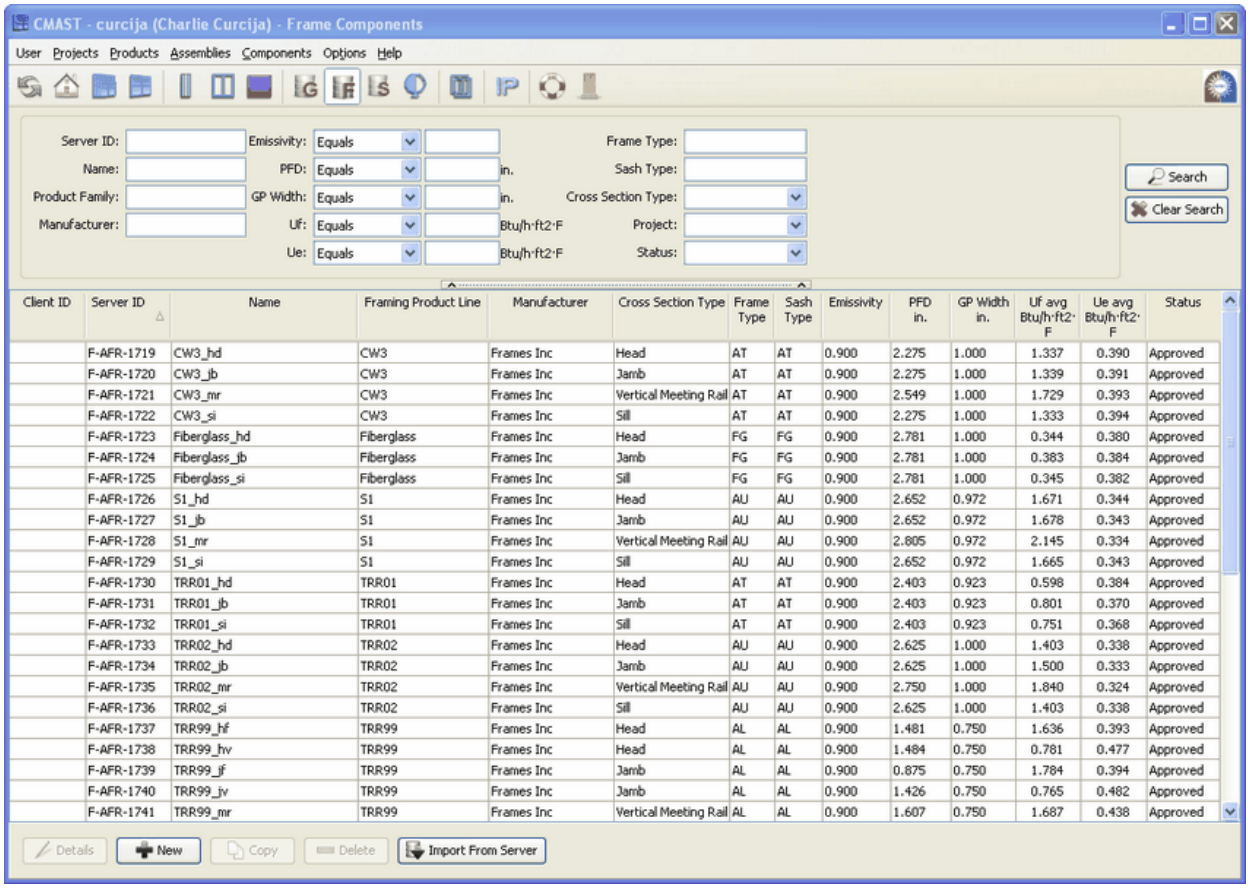
3.5.1 Search Functionality

Each list screen, such as frame component list screen, center of glazing assembly list screen, etc., has Search area at the top. Search can be done by various criteria and many of the search functions are common to different list views. Some of the search fields are strings (i.e., Name, Manufacturer, etc.) and some are numeric fields (i.e., Emissivity, PFD, etc.). Obviously, different list view screens will have different items to search, but the behavior is common. For example, if search criteria Equals is selected for Emissivity and user enters 0.2 in the numeric field, CMAST will search entire list for records that contain emissivity that is exactly 0.2. Some of search fields are drop down menus with the fixed

© 2010 National Fenestration Rating Council, Inc.

selection of criteria (e.g., Cross Section Type Jamb), as opposed to other fields where arbitrary string or number can be entered.

Search will find all records that contain search entry. For example in the screen below, if user enters cw3 in Name field, CMAST will display F-AFR-1719, F-AFR-1720, F-AFR-1721, and F-AFR-1722. Name does not have to start with cw3. It can be located anywhere in the name. Search is not case sensitive, so either cw3 or CW3 could have been entered.



3.5.2 Glazing Layer Components

Glazing Layer Components library is a part of the CMAST client database for storing various glass types, allowing their further usage in center-of-glazing assemblies. In addition to approved glasses from IGDB that are included in the CMAST client database, laminates and glazings with applied film created in OPTICS can be also imported. List of all glazing components in the library, along with their properties and information about manufacturer and source, is presented in the **Glazing Layer Components** screen. This screen, accessible either by selecting the **Glazing Layer Components** option from the Components menu, or the **Glazing Layer Components** button in the main screen toolbar, consists of two major areas - **Search** and **Data List**.

Search area is placed in upper part of the screen providing options for filtering glazing

© 2010 National Fenestration Rating Council, Inc.

layers in the library according to several criteria. Options for filtering include both searching for specific textual data (which is case insensitive) and for numerical data ("Equals", "Less than", "Greater than" and "Between" options). After the filtering is done (using the **Search** button), pressing the **Clear Search** button will reset glazing layer records display to initial (full list) view.

Data List area contains summary of glazing layer records in the library and their related data. Sorting of the glass records by grid column headings can be done, and number of displayed records depends on applied filtering (if there are any).

Client ID	Server ID	Name	Product	Manufacturer	Source	Glazing Type	Color	Thickness in.	Tsol	Rsol2	Rsol1	Tvis	Rvis1	Rvis2	Tir	Emiss1	Emiss2	Status
	100	BRONZE_3.DAT	Generic Bronze	Generic	IGDB v11.4	Monolithic		0.123	0.646	0.063	0.062	0.680	0.065	0.066	0.000	0.840	0.840	Approved
	102	CLEAR_3.DAT	Generic Clear G	Generic	IGDB v11.4	Monolithic		0.120	0.834	0.075	0.075	0.899	0.083	0.083	0.000	0.840	0.840	Approved
	907	CMFTE2_3.AFG	Comfort E2 on (	AFG Industries	IGDB v11.4	Coated		0.122	0.695	0.101	0.115	0.830	0.096	0.087	0.000	0.204	0.840	Approved
	925	CMFTIR_3.AFG	Comfort Ti-R Lc	AFG Industries	IGDB v11.4	Coated		0.125	0.496	0.331	0.395	0.780	0.126	0.158	0.000	0.033	0.840	Approved
	1510	HMSC75.SWT	Heat Mirror(TM	Southwall Techi	IGDB v14.6	Coated		0.003	0.375	0.460	0.460	0.756	0.128	0.107	0.000	0.755	0.055	Approved
	2026	EE270-3.CIG	LoE2 270 on Cl	Cardinal IG	IGDB v14.5	Coated		0.118	0.379	0.467	0.367	0.772	0.072	0.054	0.000	0.840	0.037	Approved
	3213	LEPPIIC3.GRD	Performance Pl	Guardian	IGDB v11.4	Coated		0.117	0.424	0.445	0.367	0.757	0.141	0.112	0.000	0.836	0.044	Approved
	5025	SLGRN_3.PPG	Atlantica(R)	PPG Industries	IGDB v14.1	Monolithic		0.129	0.483	0.057	0.056	0.765	0.075	0.076	0.000	0.840	0.840	Approved
	5033	AZURL_3.PPG	Azuria(R)	PPG Industries	IGDB v14.1	Monolithic		0.129	0.445	0.055	0.055	0.770	0.072	0.072	0.000	0.840	0.840	Approved
	5041	SBRNZ_3.PPG	Solarbronze(R)	PPG Industries	IGDB v11.4	Monolithic		0.129	0.640	0.065	0.063	0.668	0.068	0.070	0.000	0.840	0.840	Approved
	5049	SGRAY_3.PPG	Solargray(R)	PPG Industries	IGDB v11.4	Monolithic		0.129	0.580	0.064	0.059	0.602	0.064	0.068	0.000	0.840	0.840	Approved
	5102	SC_BR_3.PPG	Solarcool(R) So	PPG Industries	IGDB v11.4	Coated		0.129	0.353	0.154	0.304	0.258	0.364	0.184	0.000	0.850	0.840	Approved
	5242	S500CL_3.PPG	Sungate(R) 50(	PPG Industries	IGDB v11.4	Coated		0.129	0.705	0.108	0.126	0.833	0.113	0.109	0.000	0.215	0.840	Approved
	5281	SB60 Clear-3.PPG	Solarban 60(R)	PPG Industries	IGDB v14.0	Coated		0.129	0.400	0.456	0.331	0.800	0.059	0.050	0.000	0.840	0.035	Approved
	8900	SageGlass_4_0.SAG	SageGlass(R) ti	SAGE Electroch	IGDB v16.2	Coated		0.157	0.018	0.103	0.103	0.039	0.059	0.024	0.000	0.840	0.148	Approved
	8901	SageGlass_4_1.SAG	SageGlass(R) u	SAGE Electroch	IGDB v16.2	Coated		0.157	0.498	0.131	0.180	0.696	0.167	0.081	0.000	0.840	0.148	Approved
	30010	5019/90SGP6.DUP/5011.		User	OPTICS 5.1	Laminate		0.458	0.424	0.055	0.055	0.764	0.075	0.075	0.000	0.840	0.840	Approved
	30011	102/8602.usr		User	OPTICS 5.1	Applied Film		0.124	0.821	0.088	0.086	0.894	0.092	0.092	0.000	0.840	0.954	Approved

Please note that the **Details** button at the bottom of the screen is enabled when approved glazing layer is selected, and it opens **Glazing Component** screen as read-only, providing user with all of details about the record. Otherwise, if the selected glazing layer is in the "Design" status, certain properties can be changed, as appropriate, in the the **Glazing Component** screen accessible by pressing the **Edit** button. These properties include glazing layer name, manufacturer and visibility, as well as designated inspection agency (IA), which the layer would be sent to for review and approval.

Copying of the glazing layer components is not allowed, while just the ones that are not approved can be removed from the CMAST client database using the **Delete** button. Please also note that selection of multiple records for deletion is possible by holding Shift/ Ctrl key and clicking on appropriate items in the list.

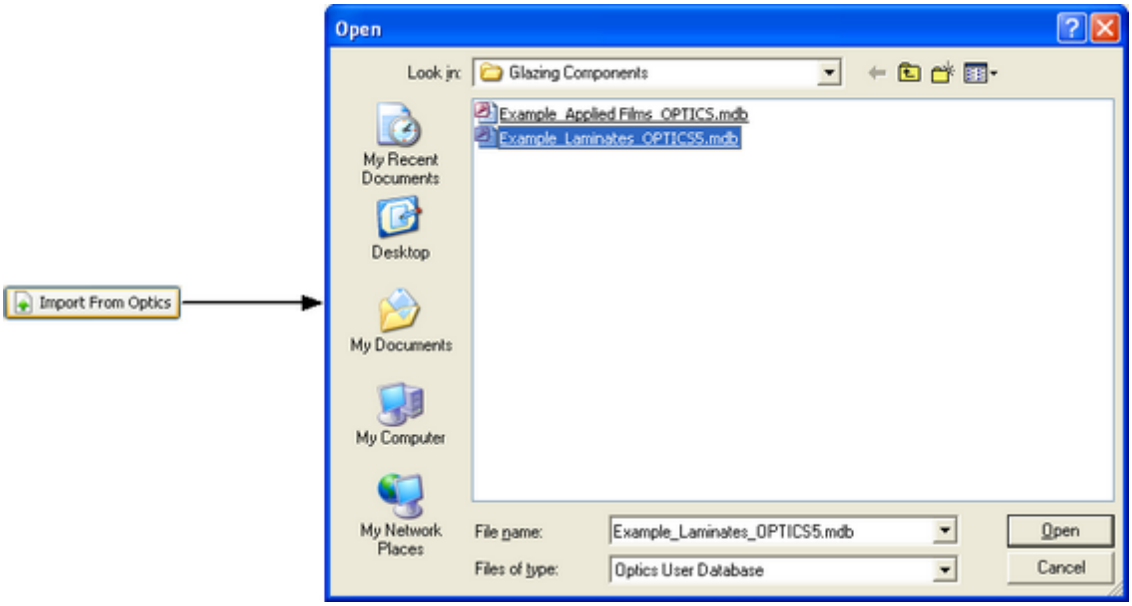
© 2010 National Fenestration Rating Council, Inc.

3.5.2.1 Glazing Layer Import From Optics

Import of glazing layers into CMAST client application is not allowed from main Optics database, but only from the user database. Any type of glazing layer can be imported, and it should be noted that only laminates and applied films can be used for certification. Therefore, if other layer types were selected for import, user would be warned that they could not be used for certified products and prompted to continue or cancel layer(s) import.

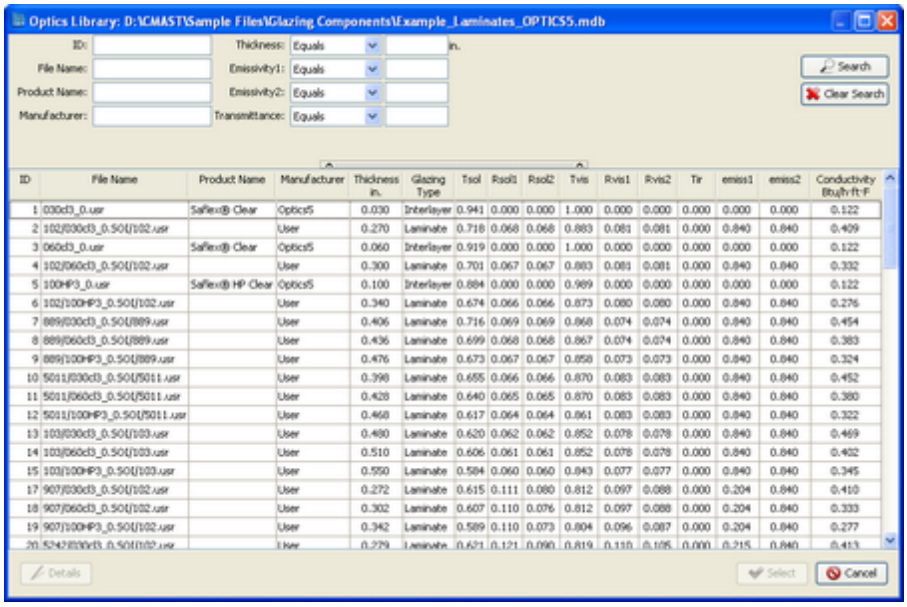
In order to import glazing layer(s) from Optics database, the following steps needs to be performed:

1. Press the **Import From Optics** button at the bottom of the Glazing Layer Components screen to start standard MS Windows Open dialog-box for selecting desired Optics user database.

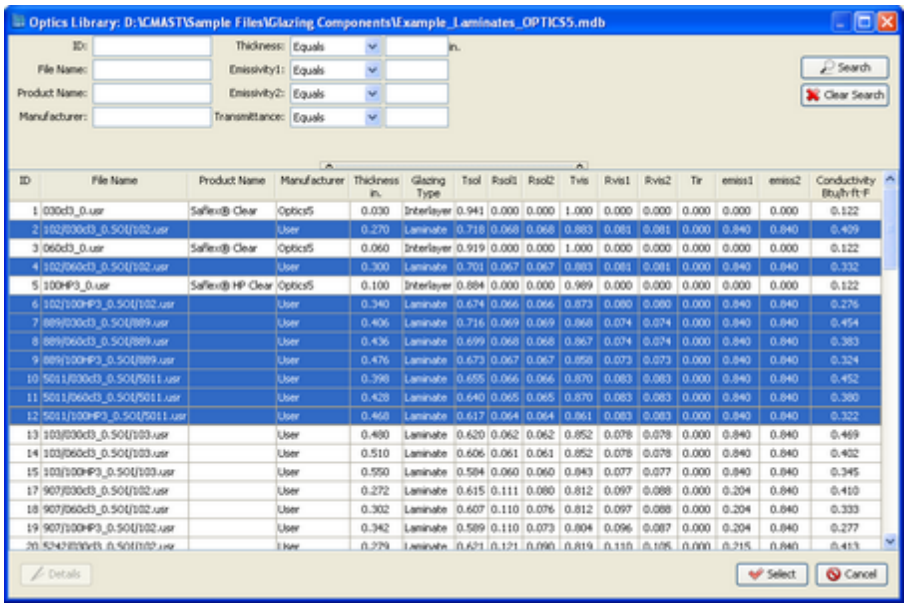


2. After the Optics database is selected, summarized information about all glazing layers it contains, including layer name, type, thickness and main properties (i.e., solar and visible transmittance, solar and visible reflectance, emissivity, conductance, etc.) will be shown in the **Optics Library** screen. Upper part of this screen contains options for filtering glazing layer records in the Optics database, as well as buttons for performing search as per defined criteria, and resetting search criteria fields and refreshing glazing layers display to full list view.

© 2010 National Fenestration Rating Council, Inc.



3. Individual glazing layers can be selected for import by clicking on them, and, in addition, standard methods for selection of multiple records by holding Shift/Ctrl key and clicking on appropriate items from the list are also supported.



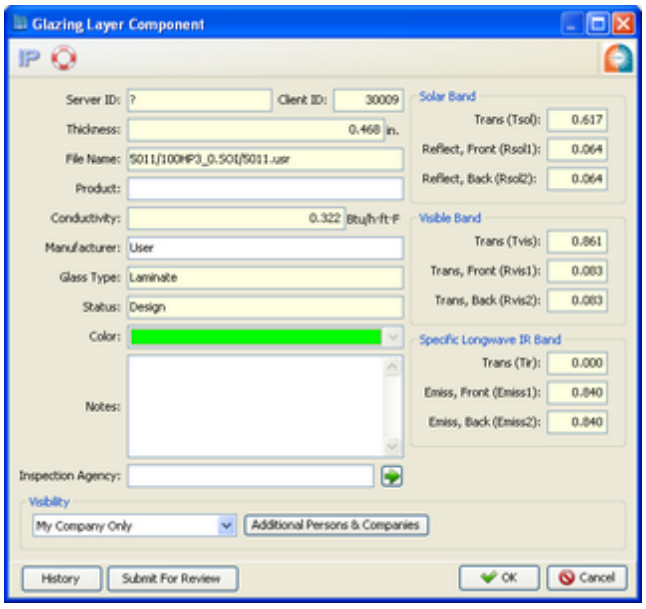
4. After pressing the **OK** button on the **Optics Library** screen, selected layers are automatically imported in the CMAST client database and shown in the Glazing Layer Components screen.

© 2010 National Fenestration Rating Council, Inc.

Client ID	Server ID	Name	Product	Manufacturer	Source	Glazing Type	Color	Thickness in.	Tsol	Rsol1	Rsol2	Tvis	Rvis1	Rvis2	Tir	Emiss1	Emiss2	Status
	5041	SBRNZ_3.PPG	Solarbronze(	PPG Industries	IGDB v11.4	Monolithic		0.129	0.640	0.063	0.065	0.668	0.068	0.070	0.000	0.840	0.840	Approved
	5102	SC_BR_3.PPG	Solarcool(R)	PPG Industries	IGDB v11.4	Coated		0.129	0.353	0.304	0.154	0.258	0.364	0.184	0.000	0.850	0.840	Approved
	5242	S500CL_3.PPG	Sungate(R) 5	PPG Industries	IGDB v11.4	Coated		0.129	0.705	0.126	0.108	0.833	0.113	0.109	0.000	0.215	0.840	Approved
	907	CMFTE2_3.AFG	Comfort E2 c	AFG Industries	IGDB v11.4	Coated		0.122	0.695	0.115	0.101	0.830	0.096	0.087	0.000	0.204	0.840	Approved
	925	CMFTIR_3.AFG	Comfort Ti-R	AFG Industries	IGDB v11.4	Coated		0.125	0.496	0.395	0.331	0.780	0.126	0.158	0.000	0.033	0.840	Approved
	1510	HMSC75.SWT	Heat Mirror(1	Southwall Tech	IGDB v14.6	Coated		0.003	0.375	0.460	0.460	0.756	0.128	0.107	0.000	0.755	0.055	Approved
	5281	SB60 Clear-3.PP	Solarban 60(	PPG Industries	IGDB v14.0	Coated		0.129	0.400	0.331	0.456	0.800	0.059	0.050	0.000	0.840	0.035	Approved
	2026	EE270-3.CIG	LoE2 270 on	Cardinal IG	IGDB v14.5	Coated		0.118	0.379	0.367	0.467	0.772	0.072	0.054	0.000	0.840	0.037	Approved
	5025	SLGRN_3.PPG	Atlantica(R)	PPG Industries	IGDB v14.1	Monolithic		0.129	0.483	0.056	0.057	0.765	0.075	0.076	0.000	0.840	0.840	Approved
	30010	5019/90SGP6.DL		User	OPTICS 5.1	Laminate		0.458	0.424	0.055	0.055	0.764	0.075	0.075	0.000	0.840	0.840	Approved
	30011	102/8602.usr		User	OPTICS 5.1	Applied Fil		0.124	0.821	0.086	0.088	0.894	0.092	0.092	0.000	0.840	0.954	Approved
30001	?	102/030cl3_0.SC		User	OPTICS 5.1	Laminate		0.270	0.718	0.068	0.068	0.883	0.081	0.081	0.000	0.840	0.840	Design
30002	?	102/060cl3_0.SC		User	OPTICS 5.1	Laminate		0.300	0.701	0.067	0.067	0.883	0.081	0.081	0.000	0.840	0.840	Design
30003	?	102/100HP3_0.5		User	OPTICS 5.1	Laminate		0.340	0.674	0.066	0.066	0.873	0.080	0.080	0.000	0.840	0.840	Design
30004	?	889/030cl3_0.SC		User	OPTICS 5.1	Laminate		0.406	0.716	0.069	0.069	0.868	0.074	0.074	0.000	0.840	0.840	Design
30005	?	889/060cl3_0.SC		User	OPTICS 5.1	Laminate		0.436	0.699	0.068	0.068	0.867	0.074	0.074	0.000	0.840	0.840	Design
30006	?	889/100HP3_0.5		User	OPTICS 5.1	Laminate		0.476	0.673	0.067	0.067	0.858	0.073	0.073	0.000	0.840	0.840	Design
30007	?	5011/030cl3_0.5		User	OPTICS 5.1	Laminate		0.398	0.655	0.066	0.066	0.870	0.083	0.083	0.000	0.840	0.840	Design
30008	?	5011/060cl3_0.5		User	OPTICS 5.1	Laminate		0.428	0.640	0.065	0.065	0.870	0.083	0.083	0.000	0.840	0.840	Design
30009	?	5011/100HP3_0.		User	OPTICS 5.1	Laminate		0.468	0.617	0.064	0.064	0.861	0.083	0.083	0.000	0.840	0.840	Design

Once imported from the OPTICS, glazing layers get "Design" status and appropriate client IDs (30001 and higher), while their server IDs remain empty until next synchronization when would be automatically assigned by the server application.

While particular layer imported from Optics is in the "Design" status, it is possible open it by double clicking on the list, or highlighting and clicking the **Edit** button. Then, changes of the layer name, manufacturer and visibility can be made in the details screen by all registered users that have access the layer depending of its visibility. At the same time, just Simulator-In-Responsible-Charge working for ASL (accredited simulation laboratory) can specify designated inspection agency (IA) and submit the layer for review and approval using the **Submit For Review** button at the bottom of the screen.



After the glazing layer component is submitted to the IA for review, it gets "Review" status and cannot be further changed or deleted. Other users from the same ASL company can

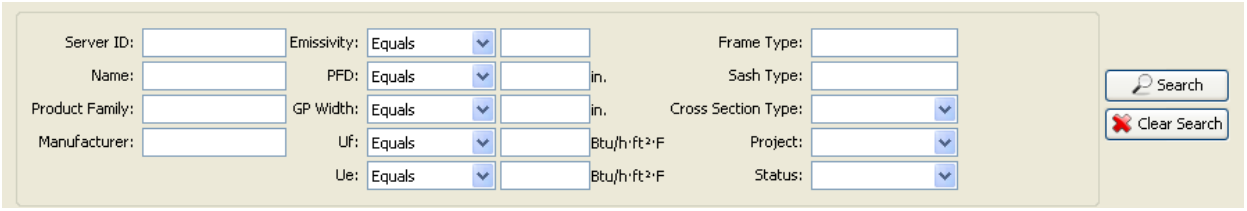
© 2010 National Fenestration Rating Council, Inc.

get the glazing layer component through synchronization, while the users from designated inspection agency (IA) can import it.

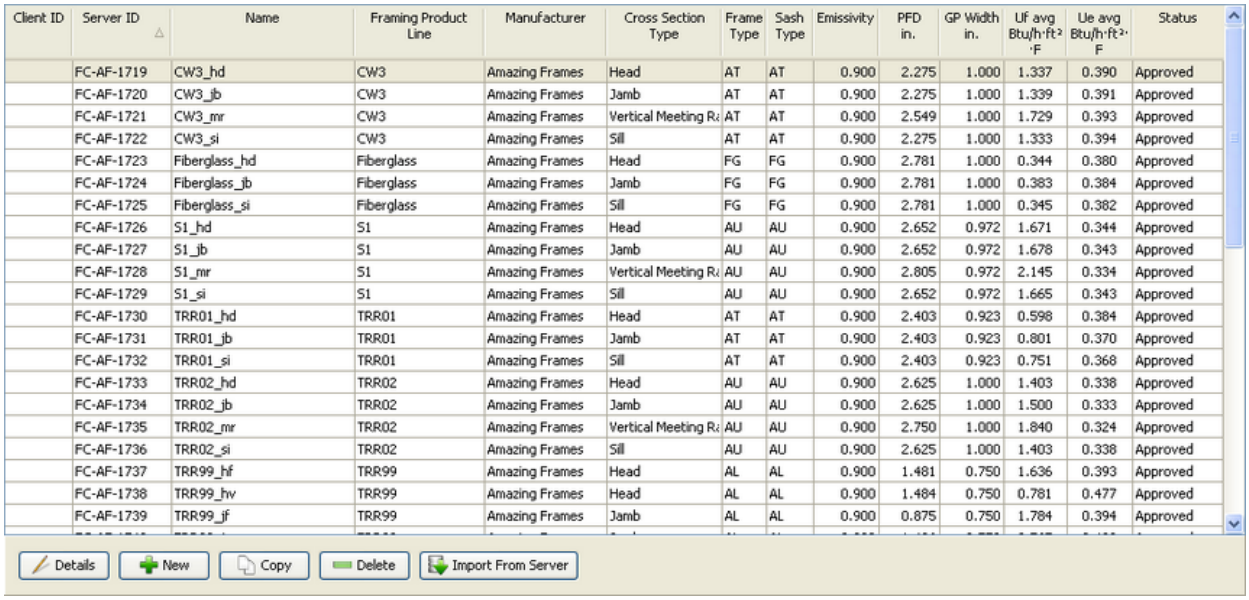
3.5.3 Frame Components

Frame Components library is a part of the client database where frame cross-section components are created and/or modified, and stored for later application in frame assemblies. Frame components are listed in the **Frame Components** screen, which is accessible using the **Frame Components** option from the Components menu, or the **Frame Components** button in the main screen toolbar. All registered CMAST users can access the Frame Components library, but just ASL users can submit component for review.

Like all other library list screens, the **Search** area with options for filtering all frame component records in the library is located in the upper part of the **Frame Components** screen.



Tabulated information about all frame components in the library in presented in the **Data List** area, and sorting them by grid column headings is allowed there, while the buttons below data grid are intended for manipulating frame components in the library.



Details/Edit - if status of the selected frame component is "Approved", "Review",

© 2010 National Fenestration Rating Council, Inc.

"Pending" or "Locked", the **Details** button is shown, and pressing it will open Frame Component screen as read-only (e.g., no data can be edited there); otherwise **Edit** button is displayed and it opens Frame Component screen with all editable fields except ID, Status and Cross-Section Type, so that modifications can be made as appropriate;

New - opens empty Frame Component screen where new frame component can be created from scratch;

Copy - to create a copy of selected frame component;

Delete - to remove selected frame component from the library. Please note that just components in the "Design" status can be deleted.

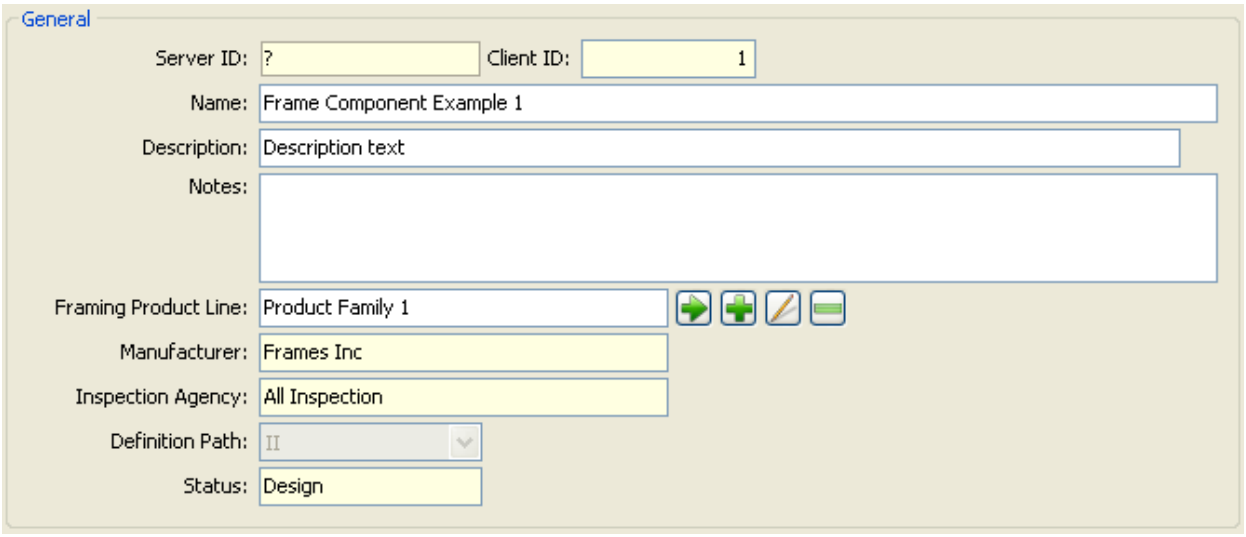
Import from Server – copies items to local client database from the server.

3.5.3.1 Frame Component Screen

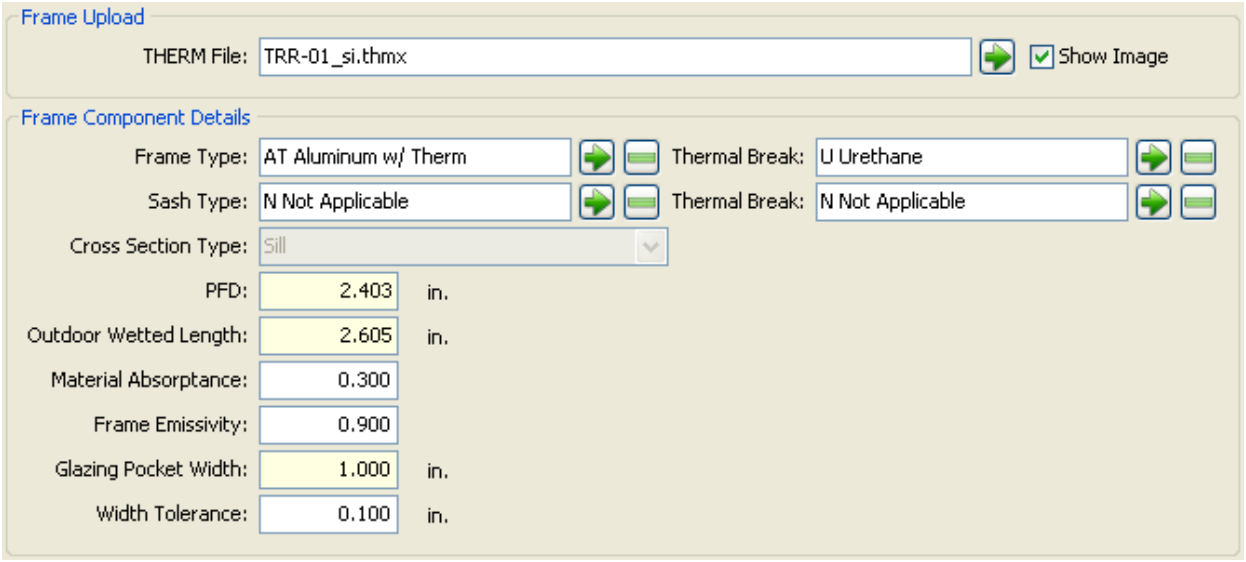
Frame Component screen is a separate screen where new frame components can be defined, as well as the ones existing in the client database modified. In order to create new frame component user can start this screen by pressing the **New** button on the Frame Library screen, while for editing existing projects can be used either selecting the frame component in the Frame Library screen and pressing the **Edit** button, or double-clicking on the selected component.

The **General** group-box in the upper part of the screen provides options for entering frame component name, description and notes, as well as for selection of Framing Product Line, which the component belongs to, from the list opened by clicking on the 'arrow' button next to corresponding edit-box. If designated Framing Product Line does not exist in the CMAST client database, it can be created using the "**+**" button. Upon selection of the Framing Product Line, associated information about manufacturer and inspection agency will be automatically input in corresponding fields. Also, selection of the Framing Product Line, as well as all associated information - manufacturer and inspection agency, can be removed by clicking the "**–**" button. Details about selected framing product line can be reviewed in a screen opened by clicking on the third button in the group next to the Framing Product Line field, and it should be noted that no changes are allowed there. Client ID is automatically assigned for new component, while Server ID will be set first time the component is uploaded to CMAST server database via synchronization.

© 2010 National Fenestration Rating Council, Inc.



In order to create new frame component, or edit an existing one, user needs to press the 'arrow' button in the **Frame Upload** group-box and select THERM file in XML format, which contains the frame component model. In addition, there is also the Show Image check-box which controls appearance of the frame component preview.

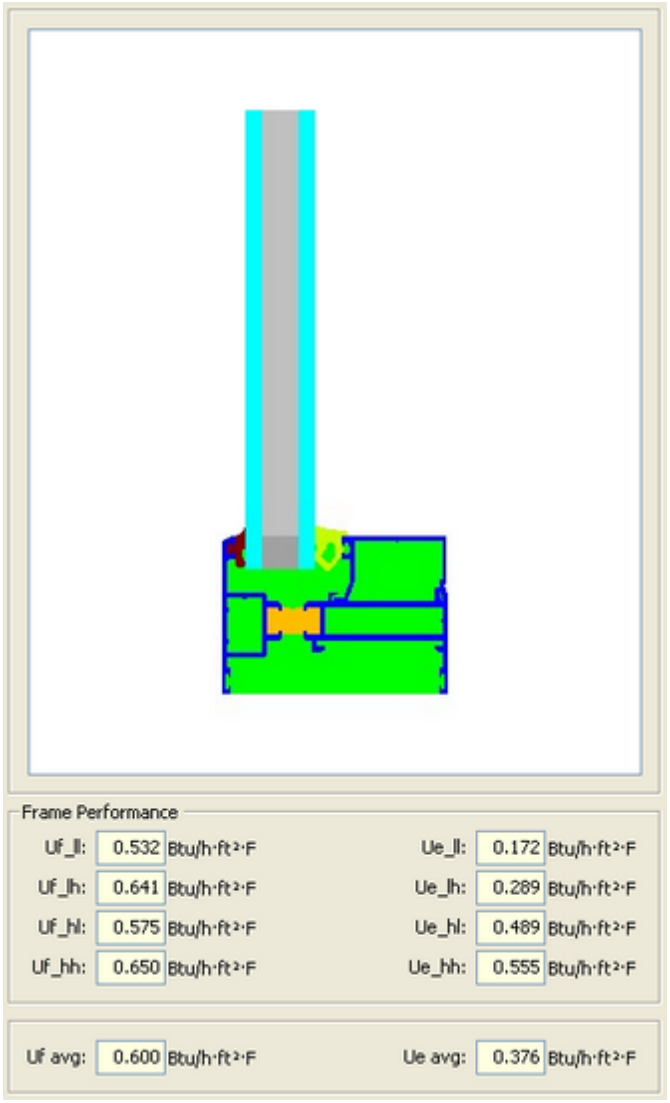


As soon as the THERM XML file is loaded, cross-section type, PFD, outdoor wetted length, glazing pocket width and default values for material absorptance, frame emissivity and width tolerance are automatically input in appropriate fields. At the same time, frame type and sash type, as well frame and sash thermal break types, need to be selected from lists available by pressing corresponding 'arrow-buttons'. Also, material absorptance, frame emissivity and width tolerance values can be manually edited, as necessary.

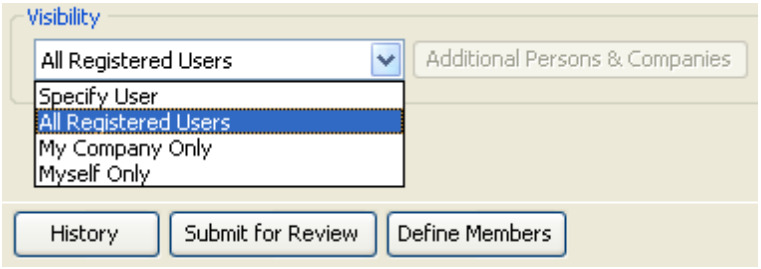
Frame performance indices for low/high options are presented in the lower-right part of the screen, while the frame component 2-D preview would be provided above if the **Show**

© 2010 National Fenestration Rating Council, Inc.

Image box is checked.



Finally, frame component visibility can be set through the combo-box at the bottom of the screen to made it available to the intended audience. Default choice is visibility to all users from the same company as the user who created component (i.e., My Company Only).



When a frame component is submitted to the IA for review by pressing corresponding

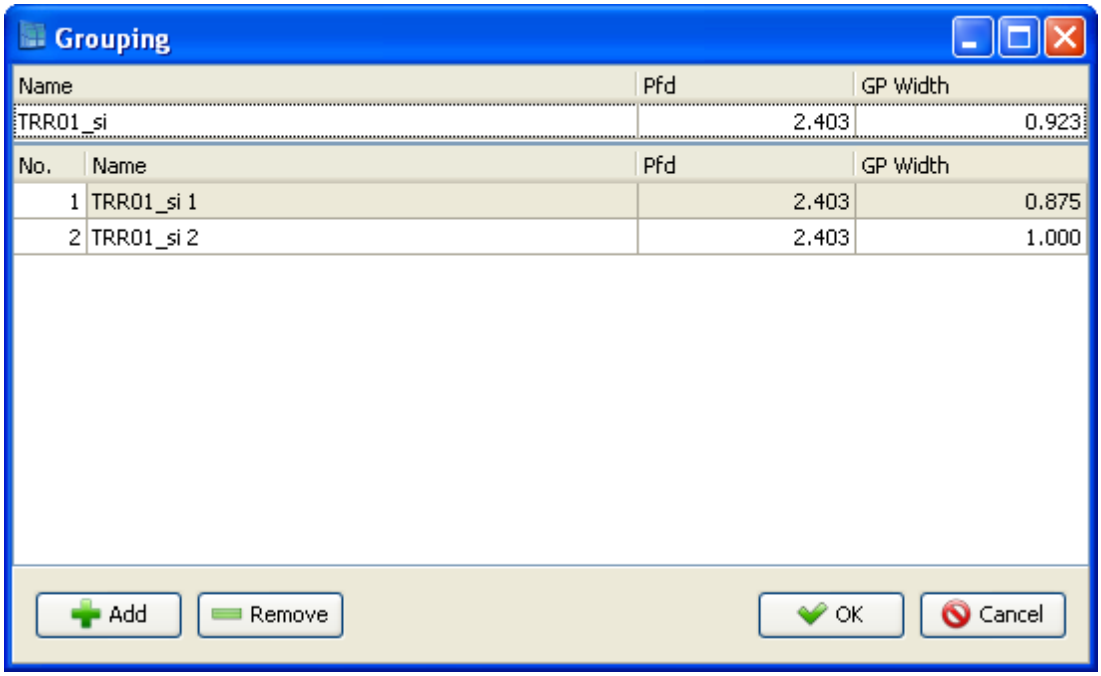
© 2010 National Fenestration Rating Council, Inc.

button at the bottom of this screen, it gets "Review" status and cannot be further changed or deleted. Also, the framing product line associated with the component, which is not already sent for validation or validated, becomes 'locked' after frame component submittal for review, meaning that other frame components can be associated with it, but users cannot change or delete it.

3.5.3.2 Frame Grouping

Users have the option to group several frame components around one component, the so called “group leader”. Group leader is a fully defined frame component (extracted from appropriate THERM model), and other group members share similar geometry, as per NFRC grouping rules. Group members assume thermal performance of the group leader and thermal indices, and the only difference between them is in PFD and Glazing pocket width. When a grouped frame component is used in a frame assembly, thermal indices and majority of properties are taken from the group leader, while name, PFD and Glazing pocket width are taken from the selected group member.

Users can group frame components in the CMAST client application by creating a group around a fully defined frame component via **Grouping** screen, accessible by clicking the **Define Members** button at the bottom of the Frame Component screen.



Details of the currently selected frame component, which is supposed to be a group leader (or it is already), including its name, PFD and Glazing pocket width are shown at the top of the screen. Table with group members is placed below, and there is possible to add or remove group members using the **Add** and **Remove** buttons, respectively, as well as to set their properties - name, PFD and glazing pocket width, by typing-in data in corresponding grid cells.

© 2010 National Fenestration Rating Council, Inc.

Once created and saved by clicking on the OK button, grouped frame members will be displayed in the Frame Component list screen along with the group leader. It should be noted that the group members have the same client ID as the group leader, while server IDs for group leader and group members, if already assigned, are differentiated by suffix. Suffix of the group leader Server ID is always "00", and suffixes of the grouped members IDs are set as "0n" (n - number that indicates order of creation).

32	F-AFR-2352-00	TRR01_si	TRR01	Amazing Frames	Sill	AT	N	0.900	2.403	0.923	0.750	0.363	Design
32	F-AFR-2352-01	TRR01_si 1	TRR01	Amazing Frames	Sill	AT	N	0.900	2.403	0.875	0.750	0.363	Design
32	F-AFR-2352-02	TRR01_si 2	TRR01	Amazing Frames	Sill	AT	N	0.900	2.403	1.000	0.750	0.363	Design

Although displayed, grouped frame members are not directly accessible from the Frame Component list screen. Double-clicking on any of the grouped frame members in the list automatically opens the group leader in Frame Component screen. Also, it is not possible to make copies of particular grouped members using the **Copy** function the Frame Component list screen. Only frame component group leader can be copied, and all grouped members are copied in that case as well. Similarly, particular grouped frame members cannot be removed using the **Delete** button in the same screen; only group leaders can be deleted from the CMAST client database along with all grouped members.

Finally, when a frame component group leader is submitted to the IA for review, grouped frame members are sent as well. Upon approval or rejection of the group leader, status of the grouped frame members is changed accordingly, and will be updated in the CMAST client database after next synchronization with server.

3.5.4 Spacer Components

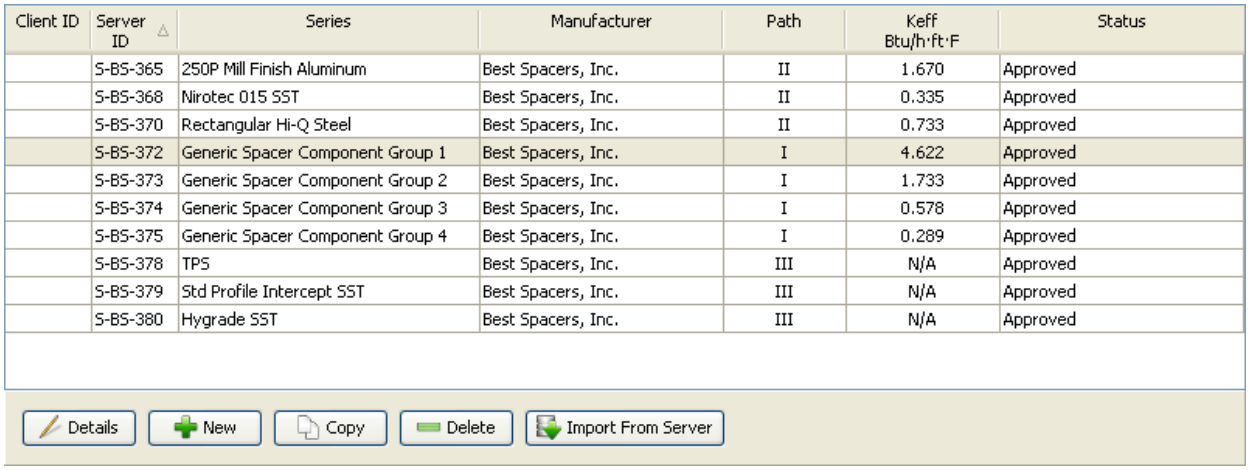
Spacer Components library provides options for adding new spacers in the client database and modifying the existing ones. The **Spacer Components** option from the Components menu, or the **Spacer Components** button in the main screen toolbar open the **Spacer Components** screen that displays tabulated data about all spacer components in the client database. As in case of the **Frame Components** screen, access to this screen, which depends on user role, is allowed just to ACE, ASL and NFRC users. Also, ACE users can create spacer components, but can not submit them for review.

Upper part of the screen again contains options for filtering library records as per specified criteria - server ID, manufacturer, series, Keff, status and project.

The data list area in the central part of the screen displays spacer series (group of spacer components, differentiated by size only), along with information about spacer

© 2010 National Fenestration Rating Council, Inc.

manufacturer, definition path, component status and effective conductivity (Keff). It should be noted that Keff value is shown just for components that have been defined under Paths I and II.



Client ID	Server ID	Series	Manufacturer	Path	Keff Btu/h·ft·F	Status
	S-BS-365	250P Mill Finish Aluminum	Best Spacers, Inc.	II	1.670	Approved
	S-BS-368	Nirotec 015 SST	Best Spacers, Inc.	II	0.335	Approved
	S-BS-370	Rectangular Hi-Q Steel	Best Spacers, Inc.	II	0.733	Approved
	S-BS-372	Generic Spacer Component Group 1	Best Spacers, Inc.	I	4.622	Approved
	S-BS-373	Generic Spacer Component Group 2	Best Spacers, Inc.	I	1.733	Approved
	S-BS-374	Generic Spacer Component Group 3	Best Spacers, Inc.	I	0.578	Approved
	S-BS-375	Generic Spacer Component Group 4	Best Spacers, Inc.	I	0.289	Approved
	S-BS-378	TPS	Best Spacers, Inc.	III	N/A	Approved
	S-BS-379	Std Profile Intercept SST	Best Spacers, Inc.	III	N/A	Approved
	S-BS-380	Hygrade SST	Best Spacers, Inc.	III	N/A	Approved

Details | New | Copy | Delete | Import From Server

If no spacer series are selected, just **New** and **Import From Server** buttons are enabled, otherwise buttons **Edit**, **Copy** and **Delete** for manipulating existing components in the library are enabled, as well.

Details/Edit - if the spacer component status is 'Approved', the **Details** button is displayed and pressing it will open Spacer Component screen as read-only (e.g., no data can be edited there), otherwise the **Edit** button is shown and it opens Spacer Component screen where modifications can be made if necessary;

New - opens empty Spacer Component screen where new component can be created from scratch;

Copy - to create a copy of selected spacer component;

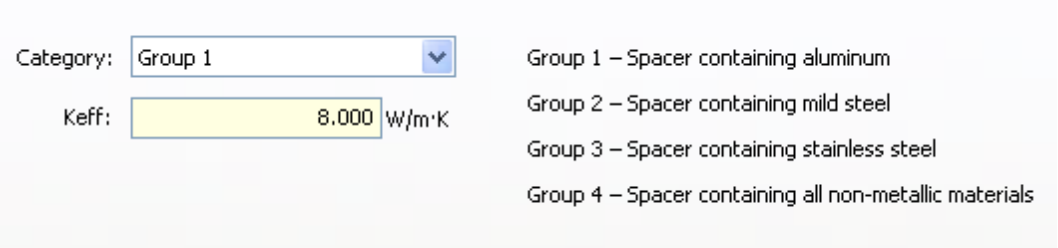
Delete - to remove selected spacer component from the library. **Note**: approved spacer component cannot be deleted.

Import From Server - allows for the import of spacer data available on the CMAST server database.

3.5.4.1 Spacer Component Approval Paths

There are three approval path options for spacer component approval. **Path I** approval is the generic path, where a spacer is grouped into 1 of 4 categories based on the material of that spacer. Each category is assigned a single effective conductivity, which represents the worst case for that grouping.

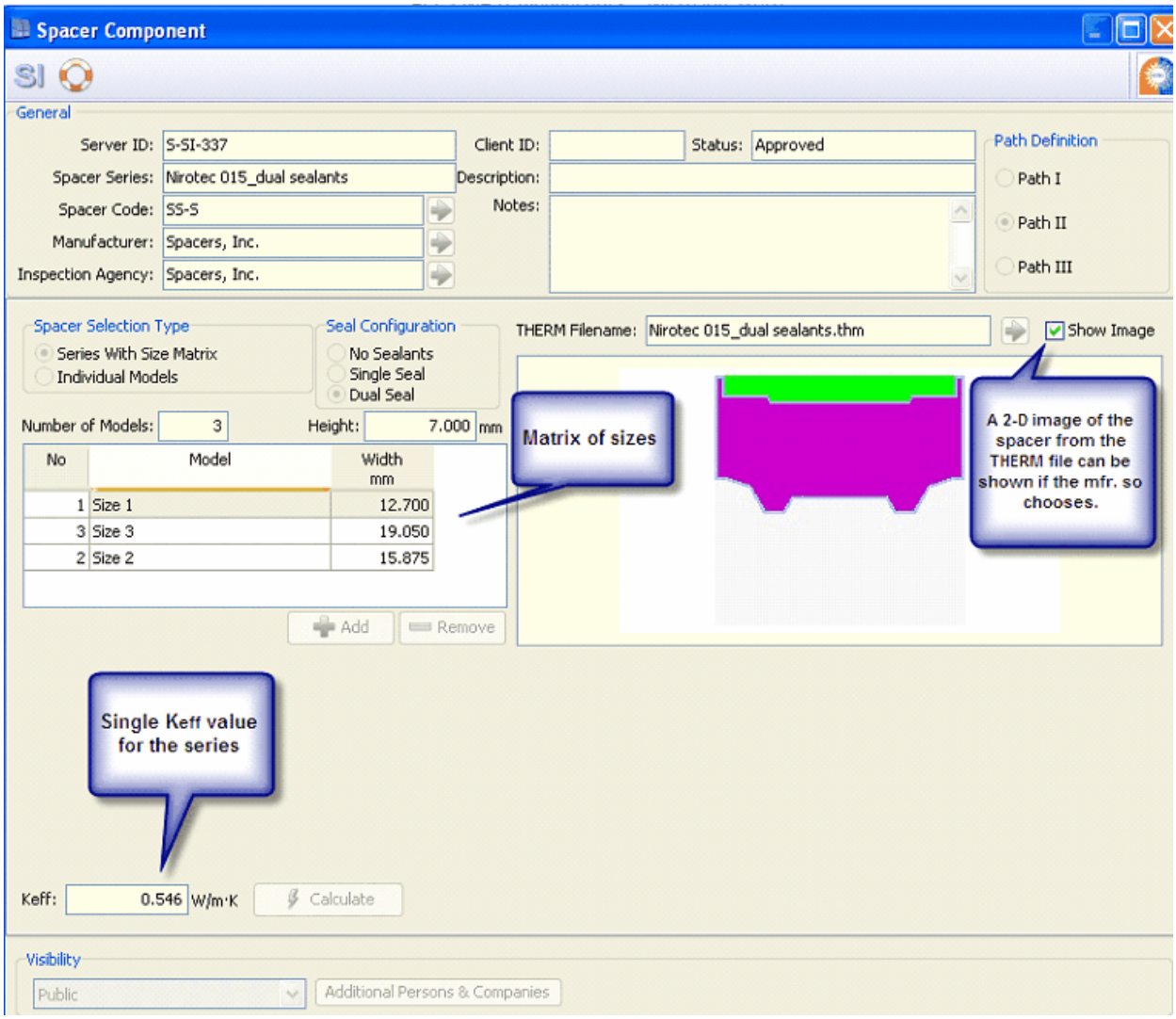
© 2010 National Fenestration Rating Council, Inc.



Once approved under Path I , the corresponding spacer edge seal assembly is also created and will be listed in the Spacer Edge Seal Assemblies screen.

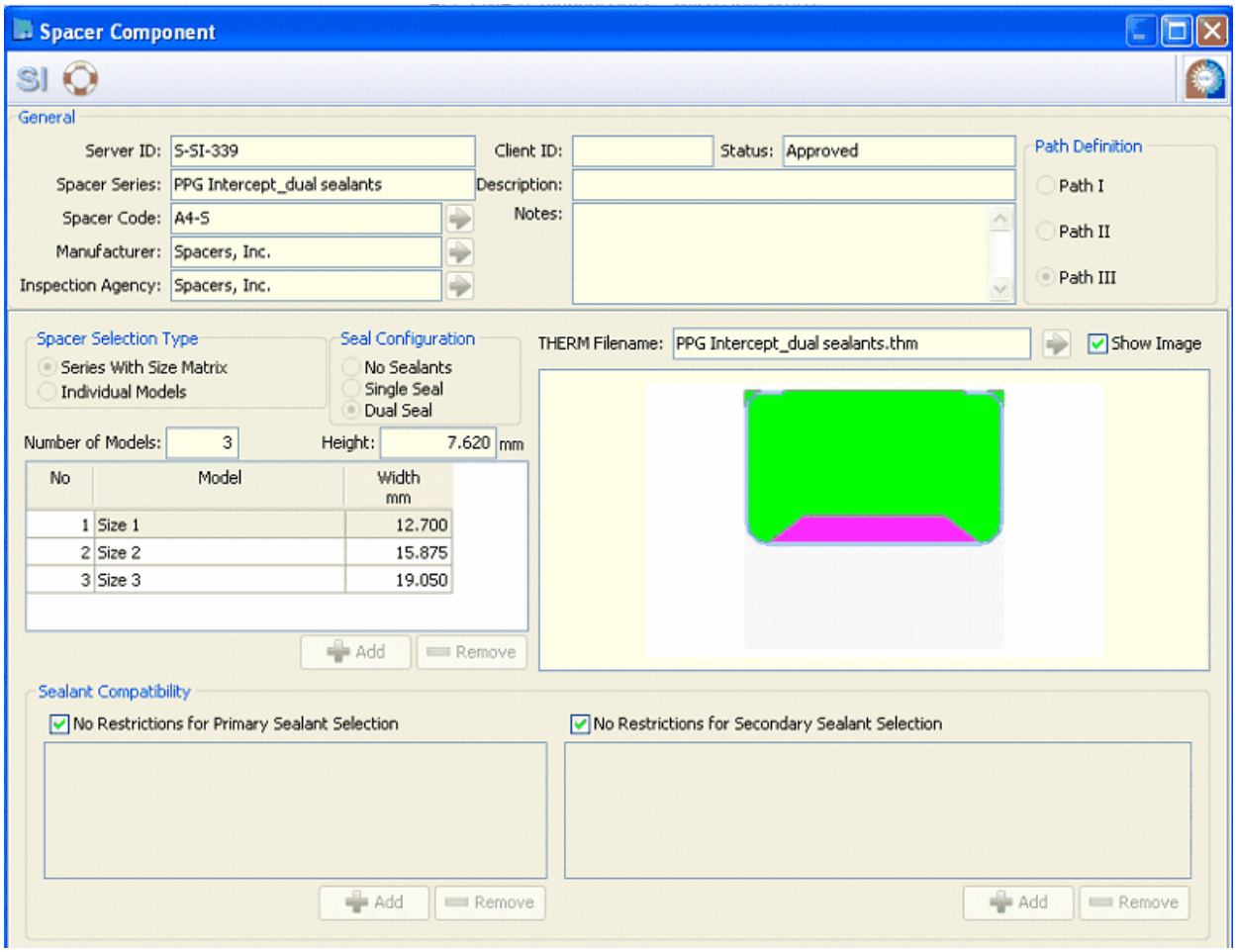
Spacer components are defined in **Path II** by an accredited simulation laboratory. The simulator models the spacer in THERM 6 with default sealant, imports the THERM file into CMAST, develops a matrix of sizes (each available width in the series) for that spacer series, either in THERM or CMAST, and calculates the k_{eff} for the series in CMAST. The spacer edge-seal assembly with the highest k_{eff} value shall be used to represent all spacer geometries for the spacer component. Only one k_{eff} is submitted for inclusion in the spacer component library to represent a spacer component approved under this path. Double clicking on a Path II spacer from the spacer component screen listing displays the details of that particular Path II spacer:

© 2010 National Fenestration Rating Council, Inc.



Spacer components are also defined by an accredited simulation laboratory in **Path III** for inclusion in the spacer library. Under this path the simulator will model the spacer bar in THERM and upload that data into CMAST for IA for review and approval. Each spacer component in the series will have a unique width. The k_{eff} is not calculated at the time of component approval. Rather, the spacer edge-seal assembly, consisting of the spacer component, desiccant, and any sealants, as appropriate, is generated on demand by the ACE at the time the whole product is calculated.

© 2010 National Fenestration Rating Council, Inc.



In addition, options at the bottom of the Path III screen allows the simulator user to specify any recommended primary and secondary sealant materials and dimensions for the spacer edge seal assembly of the spacer component. Depending on the selection in the **Seal Configuration** group-box (i.e., Single Seal or Dual Seal), the **Sealant Compatibility** group-box will be displayed with a section for Primary Sealant, or with sections for both Primary and Secondary Sealant. **No Restrictions** boxes are checked by default, which means there are no recommended materials or dimensions for primary and secondary sealants.

When the “No restrictions” boxes are unchecked, primary and secondary sealant grid lists will be displayed accordingly. New materials can be added to the list of recommended sealants using the **Add** button which opens the Materials selection list. Default sealant dimensions, with a range of minimum and maximum values, are offered for each new material defined in the grid, and the simulator can edit these values by typing-in desired values. In addition, an existing selection of primary/secondary sealant materials in the grid can be changed by clicking on the ”Green Arrow” buttons next to the material names and choosing another material from the Materials selection list. Finally, selected materials can be deleted from primary/secondary sealant materials list using the **Remove** button.

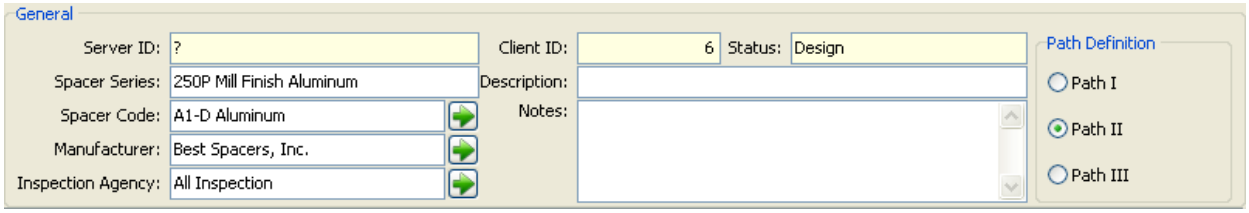
© 2010 National Fenestration Rating Council, Inc.

3.5.4.2 Spacer Component Screen

Spacer Component screen is used for creation of new spacer components and reviewing/editing components that exist in the client database. Access to this screen is possible by selecting spacer component and pressing the **New** button on the Spacer Library screen (in case of new component creation), or either selecting the spacer component in the Spacer Library screen and pressing the **Edit** button, or double-clicking on the selected component (in case of spacer component editing).

New spacer components can be defined in CMAST client application in three ways - Path I, Path II and Path III, and that affects layout of the Spacer Component screen. Path I spacers are designated by NFRC staff per the NFRC CMA-PCP, while Path II and III spacers must be defined by an accredited simulation laboratory in order to be submitted for review and approval.

The General group-box is always displayed regardless of definition path, and it contains options for specifying spacer series name, for selection of spacer code, manufacturer and inspection agency from the corresponding lists that are opened by clicking on the 'arrow' buttons next to particular edit-boxes, as well as radio button selection of spacer path definition.



Depending on the selected **Path Definition**, the layout of the area below the **General** group-box area will vary in order to provide controls necessary for specifying all data needed for the creation of spacer components in each path, which is explained in the following sections.

3.5.4.3 Spacer Component - Path I definition

When Path I is selected as the definition path, the area below the **General** group-box will contain a drop-down list for specifying the spacer component category and field for spacer Keff value.

Available categories are differentiated in four groups based on spacer material, and when the category is selected, the corresponding Keff value is automatically input in the field below.

© 2010 National Fenestration Rating Council, Inc.

Upon saving spacer component, defined according to Path I, in the database by pressing the **OK** button, corresponding spacer edge seal assembly is also created and presented in the Spacer Edge Seal Assemblies screen. It should be noted that spacer components defined as per Path I in client application cannot be submitted for review and approval. Approved components are created by NFRC staff through CMAST web portal, and will be available to all registered users via synchronization.

3.5.4.4 Spacer Component - Path II definition

Spacer components that are defined in Path II must have either a "Single Seal" or "Dual Seal' configuration (i.e., "No Sealants" configuration is not allowed), and there are two options for their creation - **Series with Size Matrix** or **Individual Models**.

1. Series with Size Matrix

In this option, spacer components in the series are created by resizing the initially selected spacer component model to fit all desired dimensions. In this case, the THERM (.thm) file containing the spacer model is selected via standard MS Windows Open dialog-box, opened by clicking on THERM Filename ”Green Arrow” button.

After the THERM file is selected, CMAST checks the spacer configuration to determine if it satisfies the following criteria:

- **Spacer Bar configuration** - model in the THERM file must consists of three segments - Left, Middle and Right, with proper attributes (e.g. Left Segment, Middle Segment, Right Segment) assigned to polygons representing those segments, in order to be resizable for creation of all component sizes in the matrix. For more details about required spacer bar configuration please refer to Appendix A section. During resize, dimensions of left and right segments remain fixed, while width of the middle segment is changeable (i.e., it is reduced or increased) in order to make the exact width for each component in the series. The overall width of the spacer bar is limited by the width of the left and right segments and can not be less than or equal

© 2010 National Fenestration Rating Council, Inc.

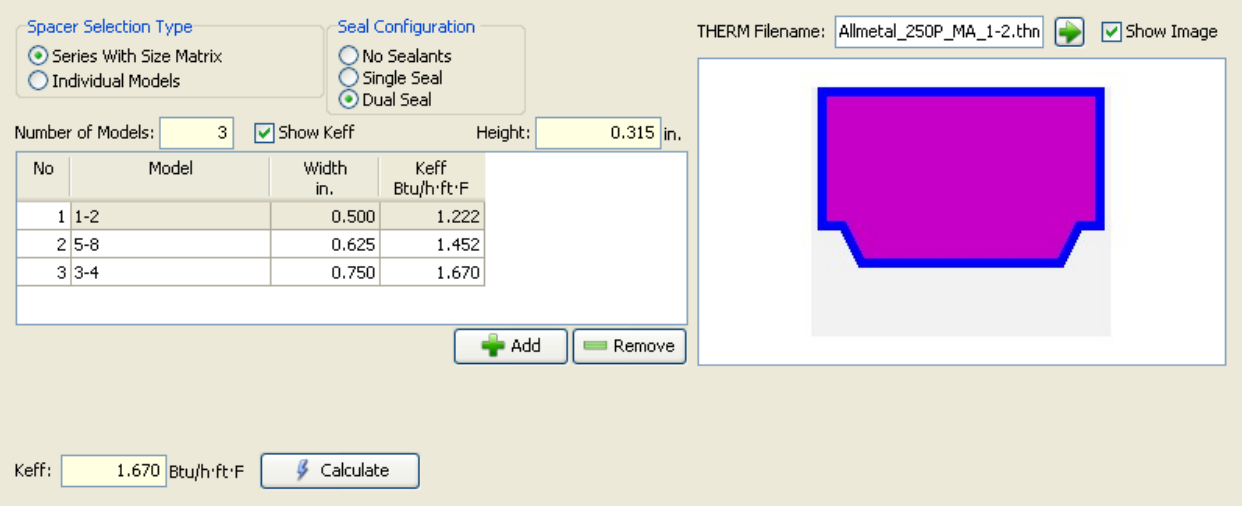
to their combined width, since their width is fixed and there needs to be at least small middle segment (more than 0.1 mm).

- **Secondary Sealant** - when "Single Seal" configuration is selected, model in the THERM file must have at least secondary sealant defined. There needs to be only one polygon with "Secondary Sealant" attribute in the THERM file and it must be placed at the bottom of the spacer. Also, left and right side of the "Secondary Sealant" polygon must be a vertical line and should match the left side and right side of the overall spacer model. Otherwise, secondary sealant is not resizable. Secondary sealant is also applicable to "Dual Seal" configuration, in which case THERM model must contain both primary and secondary sealant polygons. Primary and secondary sealants must be made of different materials in THERM model, although choice of materials is relatively arbitrary, since for Path II, CMAST applies generic materials regardless of the choice of materials in THERM file. Alternatively, spacer model with both primary and secondary sealant can be selected for 'Single Seal' configuration, in which case CMAST client application would automatically remove primary sealant.
- **Primary Sealant** - when "Dual Seal" configuration is chosen, selected THERM model must contain both primary sealant and secondary sealant, as indicated above. Primary seal is defined as two polygons with the same width and with 'Primary Sealant' attribute assigned, placed on left-most and right-most positions in the model. Also, outer edges of both primary sealant polygons must be a vertical line, while the top edges of both polygons must be horizontal.

If the above requirements are not satisfied, selection of the spacer model is canceled, and user needs to correct the THERM file before re-importing or can choose another THERM file.

When the selected THERM file is accepted, its name will be shown in the THERM Filename field, and a default name (Size 1) as well as the width of the spacer component (without primary sealant) from the selected file are automatically populated into the corresponding grid cells. Also, the height of the spacer bar is read from the selected model and displayed in the corresponding field. Pressing the "Add" button will create a new spacer model in the matrix with Size “n” as default name (n - number that indicates order of creation), and width equal to the width of the last model in the matrix. The name and width added for each model can then be edited by typing-in the appropriate data in the grid cells. Please note that maximal allowed component width in series is 500mm, while the minimal one is equal to sum of left and right segment width values (e.g., width of middle segment polygons is zero in that case). Deletion of the models from the matrix is possible by selecting desired item in the grid and pressing the "Remove" button. It should be noted that only one model at the time can be selected for deletion.

© 2010 National Fenestration Rating Council, Inc.



If user tries to change selection of THERM file, a warning message is issued with possibility to either cancel selection, or continue with it, in which case all models (sizes) in the matrix would be deleted.

2. Individual Models

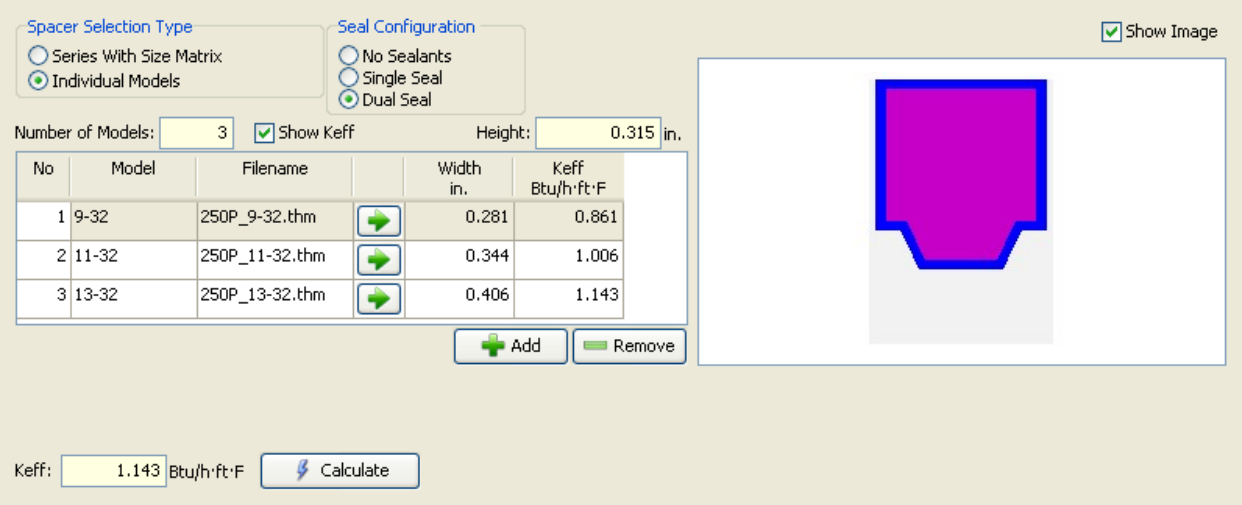
In this approach spacer component is defined as a series of individual THERM models, one per each size, so for every size user needs to load corresponding THERM file containing complete spacer component model. The "THERM Filename" field above the spacer image and selection button, which was used for "Series with Size Matrix" option are not displayed, so the models selection is done by pressing the "Add" button. Several files, which correspond to sizes user wants to define, can be selected at once, but individual selection (e.g., one file at the time) for particular models is also possible, by pressing "Add" button after the last selection was done. For each individual size, THERM filename and selection button next to it is displayed in the table. User can re-select each of the models by pressing selection button next to a filename after the original selection was done.

As in the case of spacer component definition as "Series with Size Matrix", for each selected file CMAST performs configuration checking of THERM spacer model. Criteria that the selected models must meet in terms of primary and secondary sealant configuration are the same as in case of the "Series with Size Matrix". Even though the spacer is not resized automatically, in order to determine the size of the spacer bar, it is necessary to tag left and right segments. If there is more than one left or right segment, they all need to be consistently tagged.

All selected models that satisfy aforementioned requirements are automatically loaded and corresponding data are displayed in the grid cells. Default names (Size 1, Size 2, etc.) are set to the models, but they could be edited in the grid, while the width values, representing width of the spacer components without primary sealant, are read-only, since being taken directly from corresponding THERM files. Height value is also a read-only one, as it represents height of the spacer bar from the selected model files. At the same time, Filename field in the grid displays name of the THERM file that corresponds to particular

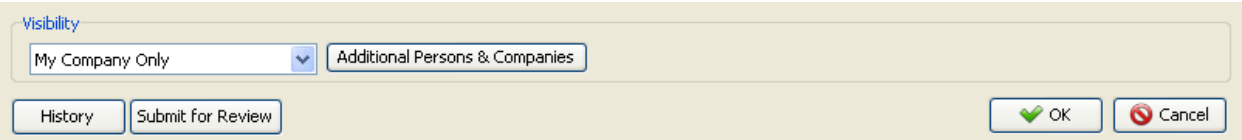
© 2010 National Fenestration Rating Council, Inc.

model (size), while the 2-D preview of each model in series will be shown in case the " Show Image" box is checked.



When the spacer component is completely defined, either as Series with Size Matrix, or as Individual Models, its effective conductivity (k_{eff}) can be determined by pressing the " Calculate" button. k_{eff} value is calculated for each model, and the highest value is assigned to the entire spacer series. Also, if the "Show Keff" box is checked, k_{eff} values for each model will be displayed in corresponding grid cells.

The Path II spacer component is saved in CMAST by pressing the "OK" button. A corresponding spacer edge seal assembly will automatically be created and listed in the Spacer Edge Seal Assemblies screen. Component visibility can be specified, and the simulator can also submit the spacer data to the designated IA for review and approval.



3.5.4.5 Spacer Component - Path III definition

Spacer component created under Path III are defined in almost identical manner as in Path II definition, with the following exceptions:

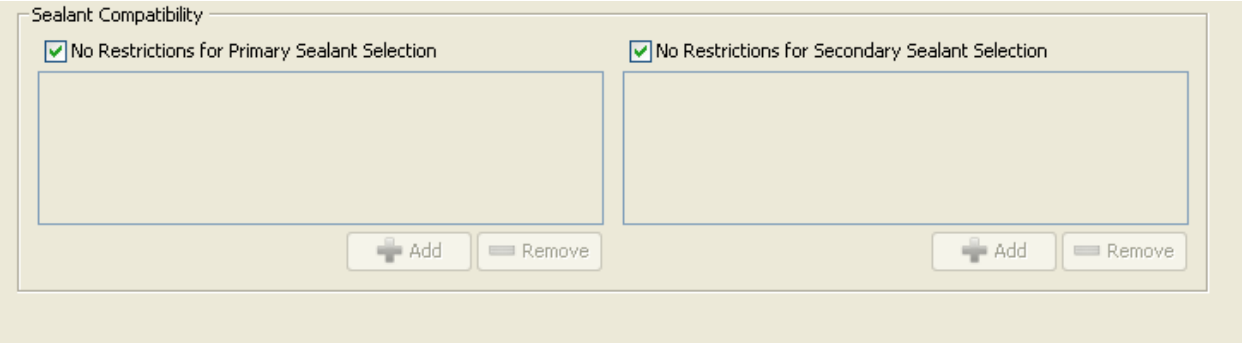
- **"No Sealants" configuration** - this configuration is allowed for Path III. If "No Sealants" configuration is selected, THERM model does not have to contain either primary or secondary sealants, but it may have both. CMAST will simply ignore them in that case. For this reason, it is highly recommended that each THERM model is made with both primary and secondary sealants, giving the user flexibility to later decide which sealant configuration it is going to select
- **Sealant Compatibility** - Path III spacer edge-seal assemblies are defined with actual

© 2010 National Fenestration Rating Council, Inc.

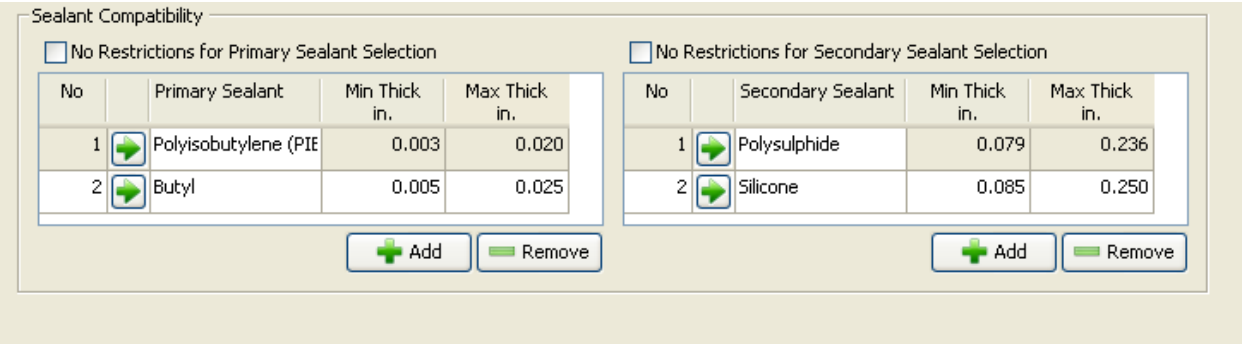
sealants, so spacer component definition also includes "Sealant Compatibility" option described below

- **k_{eff} calculation** - Because sealants for Path III are defined when spacer edge-seal assembly is defined, effective conductivity can not be calculated at the component level. Instead it is calculated when spacer edge-seal assembly is defined.

Sealant Compatibility: This selection allows user to define recommended primary and secondary sealant materials and minimum and maximum dimensions for the creation of spacer edge-seal assemblies from these spacer components. Depending on the selection in the Seal Configuration group-box (i.e., Single Seal or Dual Seal), the Sealant Compatibility group-box will be displayed with section for Primary Sealant, or with sections for both Primary and Secondary Sealant. 'No Restrictions' boxes are checked by default, which means there are no recommended materials or dimensions for primary and secondary sealants.



When the “No restrictions” boxes are unchecked, primary and secondary sealant grid lists will be displayed accordingly. New materials can be added to the list of recommended sealants using the "Add" button which opens the Materials selection list. Default sealant dimensions, with a range of minimum and maximum values, are offered for each new material defined in the grid, and user can edit these values by typing-in desired values. In addition, an existing selection of primary/secondary sealant materials in the grid can be changed by clicking on the ”Green Arrow” buttons next to the material names and choosing another material from the Materials selection list. Finally, selected materials can be deleted from primary/secondary sealant materials list using the "Remove" button.

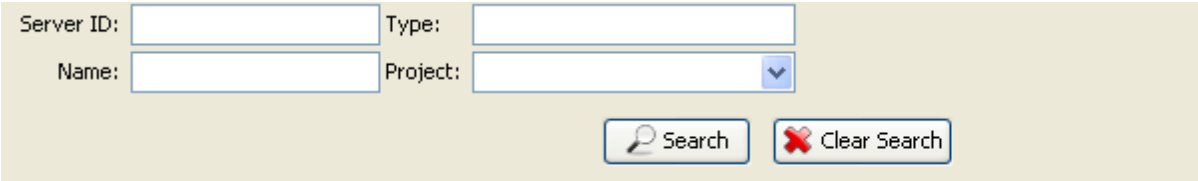


© 2010 National Fenestration Rating Council, Inc.

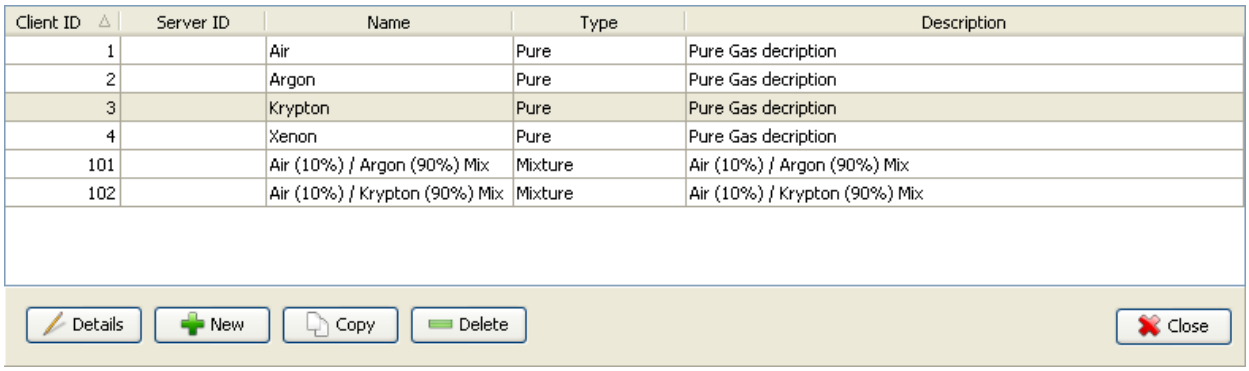
3.5.5 Gas Components

Gas Components library is used for reviewing/editing existing gasses and gas mixtures in the client database, as well as for addition of new the ones. It is accessible using **Gas Components** option from the Components menu, or the **Gas Components** button in the main screen toolbar.

As in case of previous library list screens, options for filtering library records are placed in the upper part of the screen.



List of existing gasses and gas mixtures in the database is displayed in the central part of the screen with possibility of sorting data by grid column headings, while the buttons below the list can be used for manipulating gasses and gas mixtures in the library. Please note that Air (10%) / Argon (90%) mixture that is included in the program database can be copied, but cannot be modified or deleted.



Details/Edit - if pure gas is selected, the **Details** button is displayed and pressing it will open Pure Gas screen as read-only; otherwise the **Edit** button is displayed and it opens Gas Mixture screen where the mixture can be modified;

New - opens empty Gas Mixture screen where new gas mixtures can be created;

Copy - to create a copy of selected gas mixture (copying pure gas record is not possible);

Delete - to remove selected gas mixture from the library (removing pure gas record is not possible).

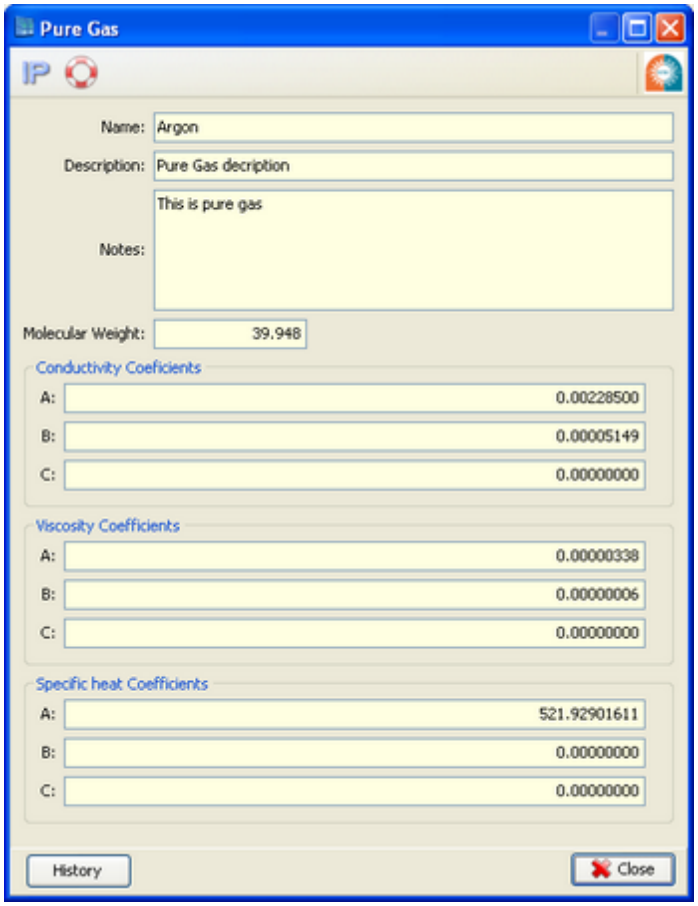
3.5.5.1 Pure Gas Screen

This screen is used for reviewing details about pure gasses in the client database, and it is invoked by either double-click on selected pure gas in the in the Gas Library screen, or by

© 2010 National Fenestration Rating Council, Inc.

selecting the pure gas and pressing the **Details** button.

In addition to the pure gas name, description, and notes, information about the gas's molecular weight and conductivity, viscosity and specific heat coefficients is also presented in corresponding fields.



3.5.5.2 Gas Mixture Screen

The **Gas Mixture** screen is intended for creation of new gas mixtures and editing the ones that exist in the CMAST client database. Access to this screen is possible by pressing the **New** button in the Gas Library screen (in case of new gas mixture creation), or by selecting existing gas mixture in the Gas Library screen and clicking the **Edit** button or double-click on the selected gas mixture (in case of gas mixture editing).

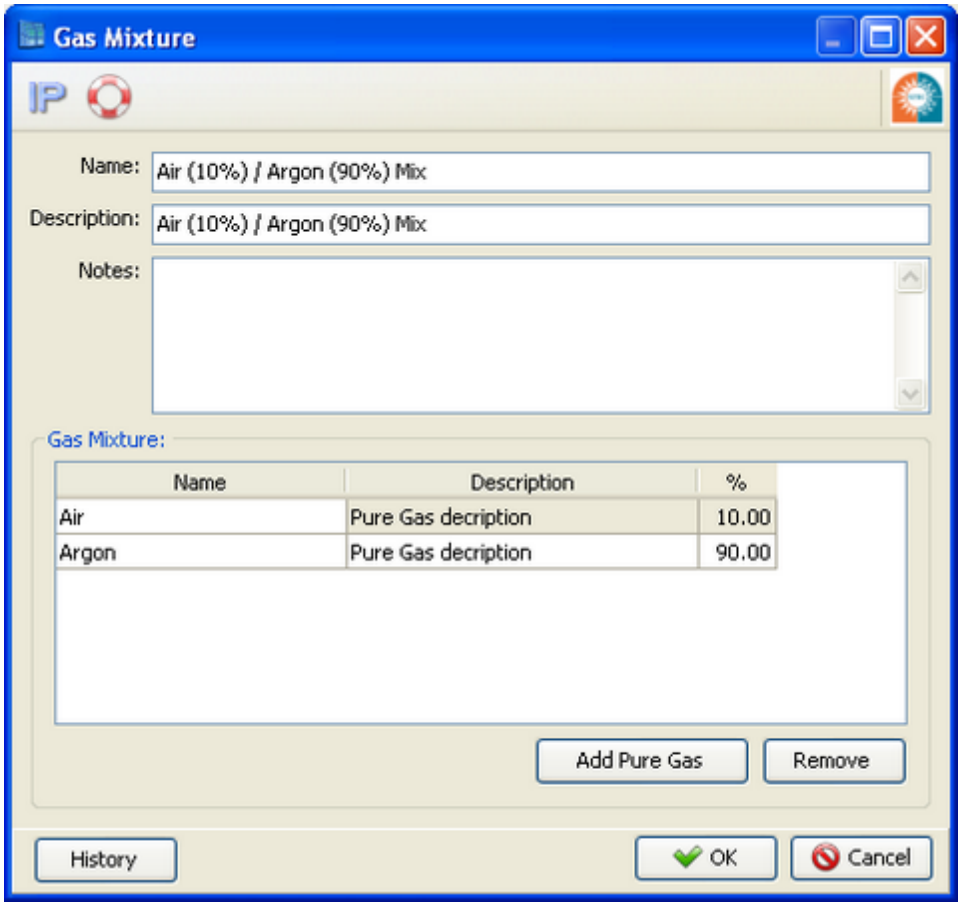
Fields for specifying gas mixture name and description are provided in the upper part of the screen, while contents of the gas mixtures are defined in the Gas Mixture grid list by adding/removing pure gasses using corresponding buttons and entering their percentage value.

New gas mixture screen starts with empty list. Gas mixture is defined by adding pure gasses and defining percentage for each pure gas in the mix. When the first pure gas is added and its percentage entered (number greater than 0 and less than 100), selection of

© 2010 National Fenestration Rating Council, Inc.

next pure gas excludes pure gasses already added and the percentage of the next gas is set to 100-percentage already entered. It is not possible to define mixture with total percentage different than 100.

When all of the pure gasses are added, gas mix is saved by pressing OK button. Editing of existing gas mixes is done by changing individual pure gasses and//or their percentages and pressing OK to save them. Gas mixes that were used in locked records become locked themselves and can not be changed. They can only be viewed in read only mode. Gas mixes that were part of non-locked records and were edited will be propagated to items that reference them and user will be warned that gas mix had been changed and will be updated in the record.



3.6 Assemblies

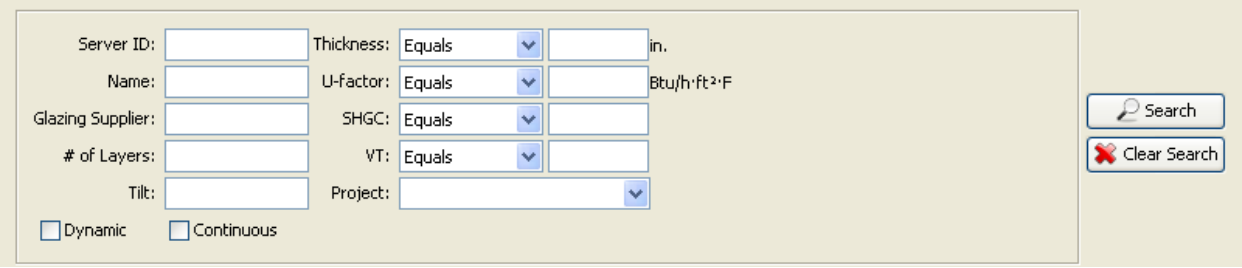
3.6.1 Center of Glazing Assemblies

New center-of-glazing assemblies can be defined in CMAST client, and also the existing ones modified, using various glass components and gasses (or gas mixtures) from corresponding libraries. Summary of all center-of-glazing assemblies in the client database is presented in the **Center of Glazing Assemblies** screen, accessible by

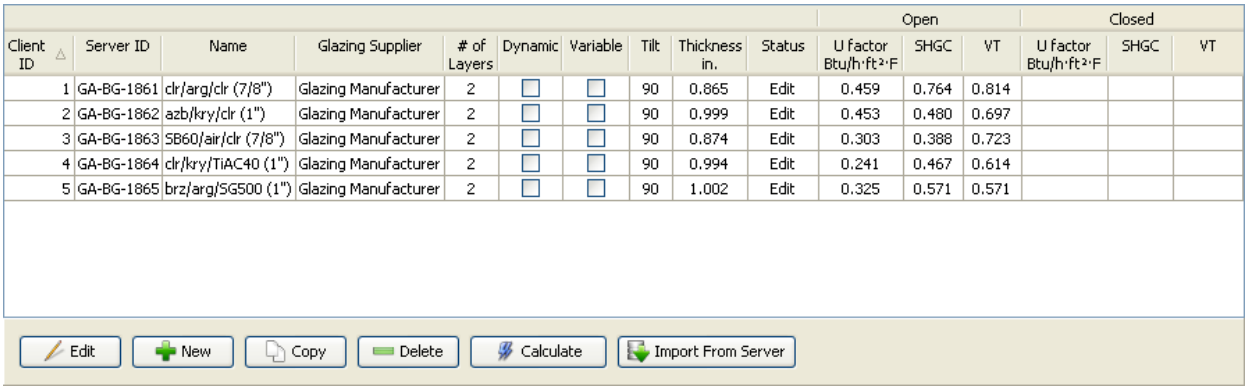
© 2010 National Fenestration Rating Council, Inc.

clicking **Center of Glazing Assemblies** option from the Assemblies menu, or **Center of Glazing Assemblies** button in the main screen toolbar.

Filtering center-of-glazing assemblies using several criteria is provided in the upper part of the screen.



List of center-of-glazing assemblies with corresponding data for each record is shown in next part of the screen, as well as the buttons for performing certain operations with center-of-glazing assemblies in the database.



Edit - opens Center of Glazing Assembly screen with possibility of modifying chosen center-of-glazing assembly;

New - opens Center of Glazing Assembly screen offering single glazed, 1/8" thick center-of-glazing assembly as default new assembly, which can than be modified to meet user needs;

Copy - creates a copy of selected center-of-glazing assembly (or assemblies) and automatically puts "Copy" in the assembly name;

Delete - removes selected center-of-glazing assembly (or assemblies) from the library;

Calculate - performs calculation for selected center-of-glazing assembly (or assemblies). Selection of multiple assemblies by holding Shift/Ctrl key and clicking on appropriate items from the list is supported.

Import From Server - allows import of each center of glazing assembly, which has been synchronized to the server for sharing, to the local client database.

© 2010 National Fenestration Rating Council, Inc.

3.6.1.1 Center of Glazing Assembly Screen

Center of Glazing Assembly screen, used for reviewing existing and creating new center-of-glazing assemblies, can be opened by pressing the **New** button in the Center of Glazing Assemblies screen (in case of new center-of-glazing assembly creation), or by selecting existing center-of-glazing assembly in the Center of Glazing Assemblies screen and clicking the **Edit** button or double-click on the selected center-of-glazing assembly (in case of center-of-glazing assembly editing).

Options in the upper left part of the screen allow user to specify center-of-glazing assembly name, description and supplier, as well as to set number of layers, and tilt angle of the assembly.

Also, there are several options for changing number of layers in the assembly. Currently selected layer can be removed using the **Delete Layer** button, and if it represents outdoor or indoor layer, adjacent gap is removed as well. If one of the mid layers is deleted, a gap below it is also removed. Another way of changing number of layers can be through the **Number of Layers** up-down box (i.e., spin-edit control with buttons - up and down arrows for increasing and decreasing number of layers). If it is increased, additional default gaps and default layers are automatically added at the bottom of the grid; otherwise layers and gaps are removed from the bottom of the grid.

Upper right part of the screen contains 2-D preview of the center-of-glazing assembly, which is updated each time the change is made to the assembly.

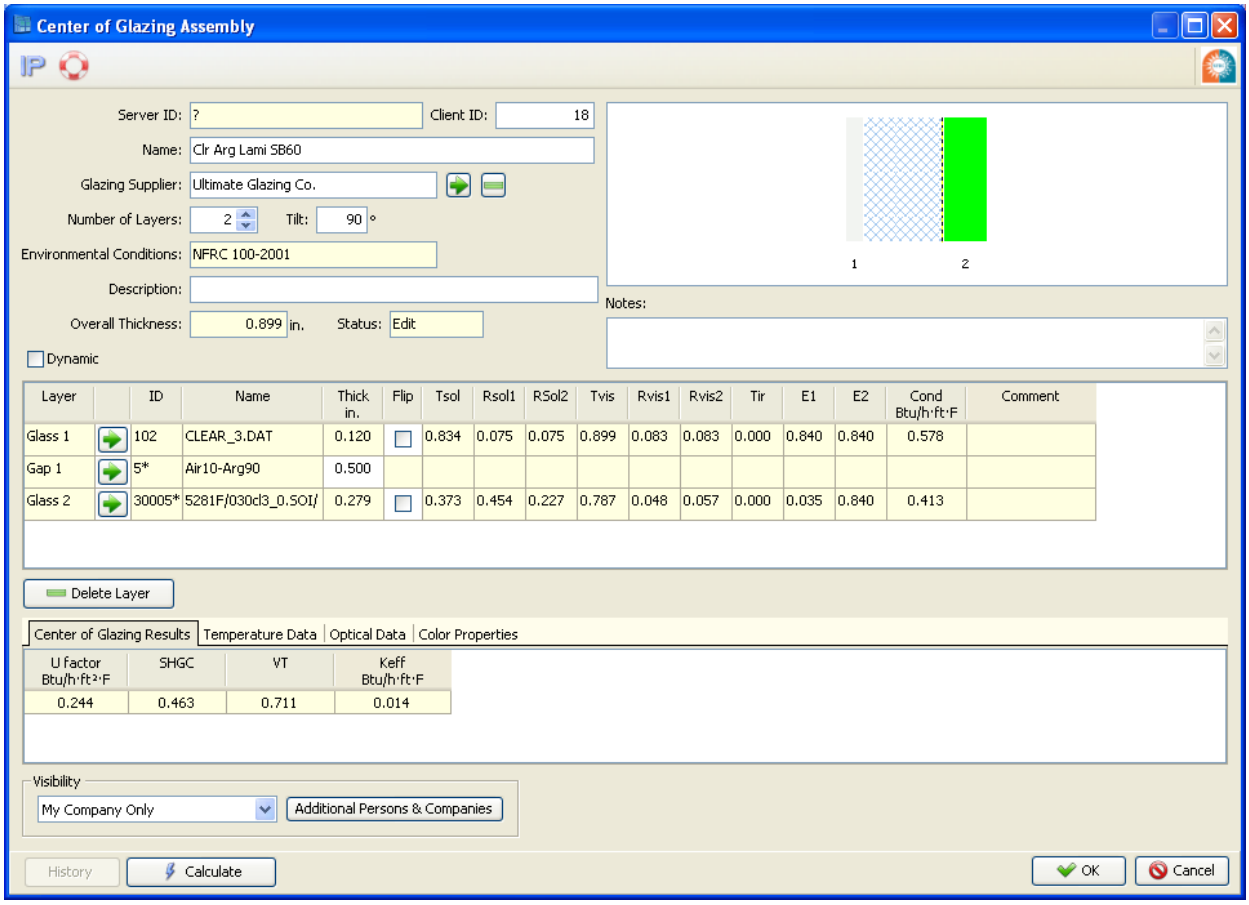
Glazing component layers are selected by pressing on the selection arrow to the left of Glazing component ID. This opens the selection list, where one of more than 2500 approved glazing components, comprising IGDB can be selected. Glazing layers can be flipped by checking **Flip** box, as appropriate. If the low-e coating faces either outdoor or indoor side, warning is issued reminding user that this should probably be corrected by checking flip box. However, in some instances low-e coating may be placed intentionally on one of those two surfaces, so user can ignore such warnings.

Gap fill is selected in a similar fashion, except that selection arrow opens gas library selection list screen. User can select from the choice of pure gasses or gas mixes, previously created. Gas gap width is defined by typing in the value. The new size is reflected in the graphics area as well.

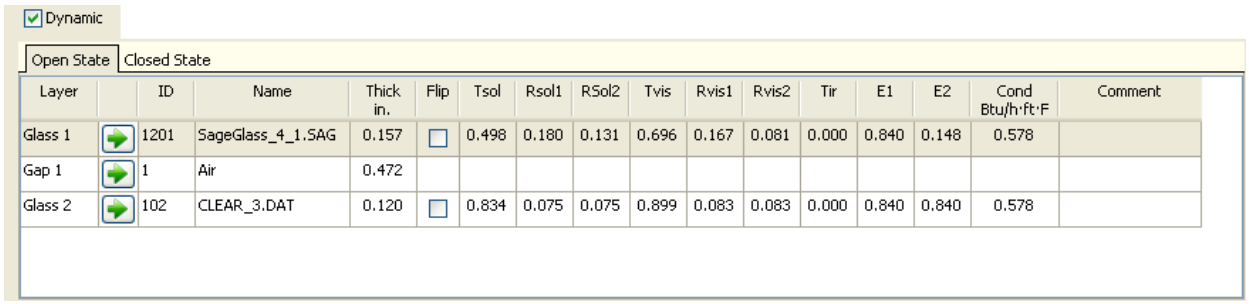
It should be noted that the client IDs of used Glazing Component and Gas (marked with *) would be displayed in corresponding grid cells in case these items were not previously synchronized with server and did not get server IDs. Otherwise, server IDs of Glazing Component and Gas (without * mark) will be displayed.

Calculation for the center-of-glazing assembly is performed after clicking the **Calculate** button, and results are grouped by type in several tabs - Center of Glazing Results, Temperature Data, Optical Data and Color Properties. Please note that the Temperature Data, Optical Data and Color Properties tabs are active only immediately after calculation. Therefore, after re-opening an existing center-of-glazing assembly user needs to repeat calculation in order to be able to review these data.

© 2010 National Fenestration Rating Council, Inc.



In addition, dynamic glazing systems are generated by clicking on the **Dynamic** check box. Two tabs are created, one for ON/Open state and one for OFF/Closed state. Glazing configuration from Open state is copied to the Closed state and user is allowed to replace one or both of glazing layers with closed state selection. Constraint is that glazing component thicknesses between open and closed state are identical. Gap fill can not be changed between two states.



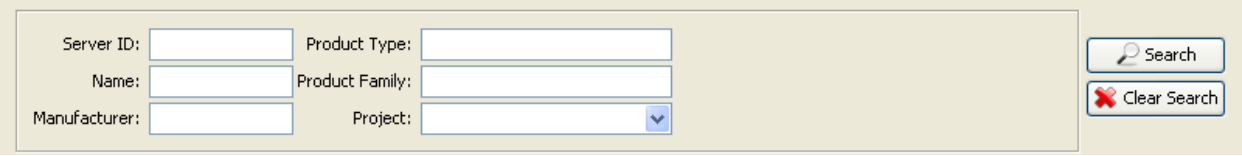
3.6.2 Frame Assemblies

New frame assemblies can be defined in CMAST client, and also the existing ones modified, using frame components from corresponding library. List of all frame

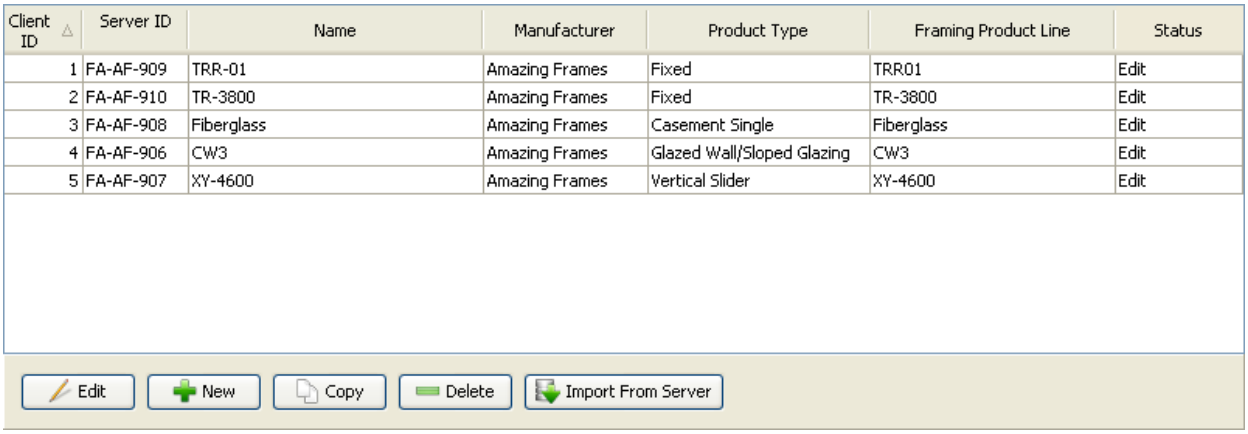
© 2010 National Fenestration Rating Council, Inc.

assemblies in the client database is shown in the **Frame Assemblies** that can be opened using **Frame Assemblies** option from the Assemblies menu, or **Frame Assemblies** button in the main screen toolbar.

Criteria for filtering frame assemblies in the database, which include assembly ID, name, manufacturer, product type, family and project, can be set through series of edit and combo-boxes in the upper part of the screen.



All frame assemblies in the database are listed in the central part of the screen, along with other information about each frame assembly record (e.g., manufacturer, product type, framing product line, status), while the buttons at the bottom of the screen are intended for manipulating frame assemblies in the database.



Edit - opens Frame Assembly screen where is possible to edit selected frame assembly;

New - opens Frame Assembly screen offering Fixed product type with NFRC standardized dimensions as default choice for new assembly, which can be modified to meet user needs;

Copy - creates a copy of selected frame assembly;

Delete - remove selected frame assembly from the library;

Import From Server - copies frame assemblies to the local client database that have been synchronized to the server for sharing

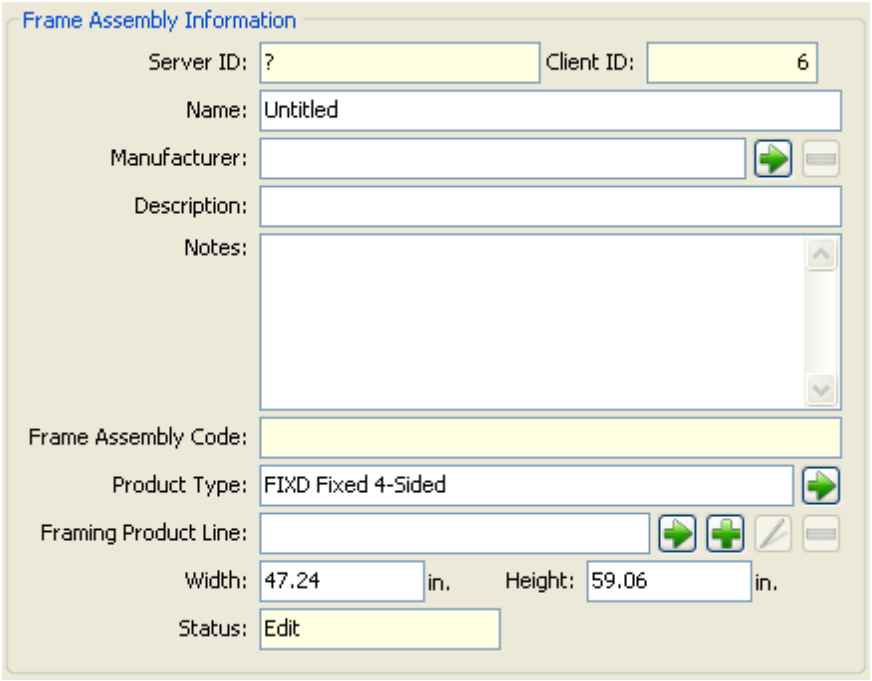
3.6.2.1 Frame Assembly Screen

The **Frame Assembly** screen serves as a place for creation and adding new frame assemblies in the CMAST client database, and also for modifying existing assemblies. This screen is also known as **Configurator**. For creation of new frame assembly user

© 2010 National Fenestration Rating Council, Inc.

needs to access it by pressing the **New** button in the Frame Assemblies screen. Existing frame assemblies can be edited by selecting frame assembly in the Frame Assemblies screen and clicking the **Edit** button, or double-clicking on the selected frame assembly.

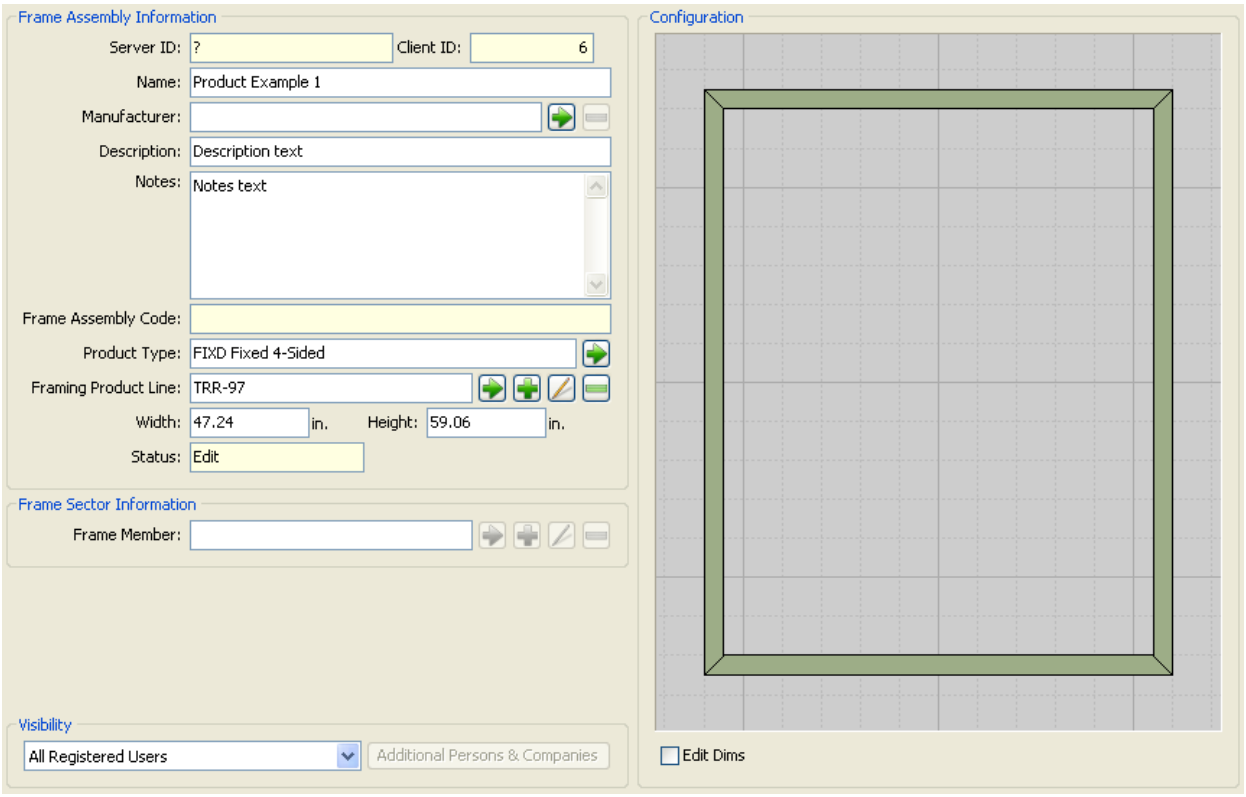
Basic information about frame assembly is defined in the upper left part of the screen, and it includes client ID (assigned by system), assembly Name, Description and Notes. Framing Manufacturer is inherited from the frame component information and is filled-in after the first frame component is selected.



Product Type is selected from the Product Codes list screen, accessible by clicking on 'arrow-button' next to the Product Type field. Product types are divided into two broad categories - NFRC approved product types and Non-approved product types. Approved product types are standard product types, such as Casement, Fixed, Horizontal Slider, Vertical Slider, etc., while non-approved product types include complex products, such as Combination, Composite and Custom. Custom is category for complex products that are neither Combination, nor Composite.

If selected product type is a simple one (e.g., casement, projected, vertical slider, etc.), its layout is predetermined and is shown immediately in the **Configuration** area. Frame members are shown in light green, indicating that frame components are not assigned to them yet.

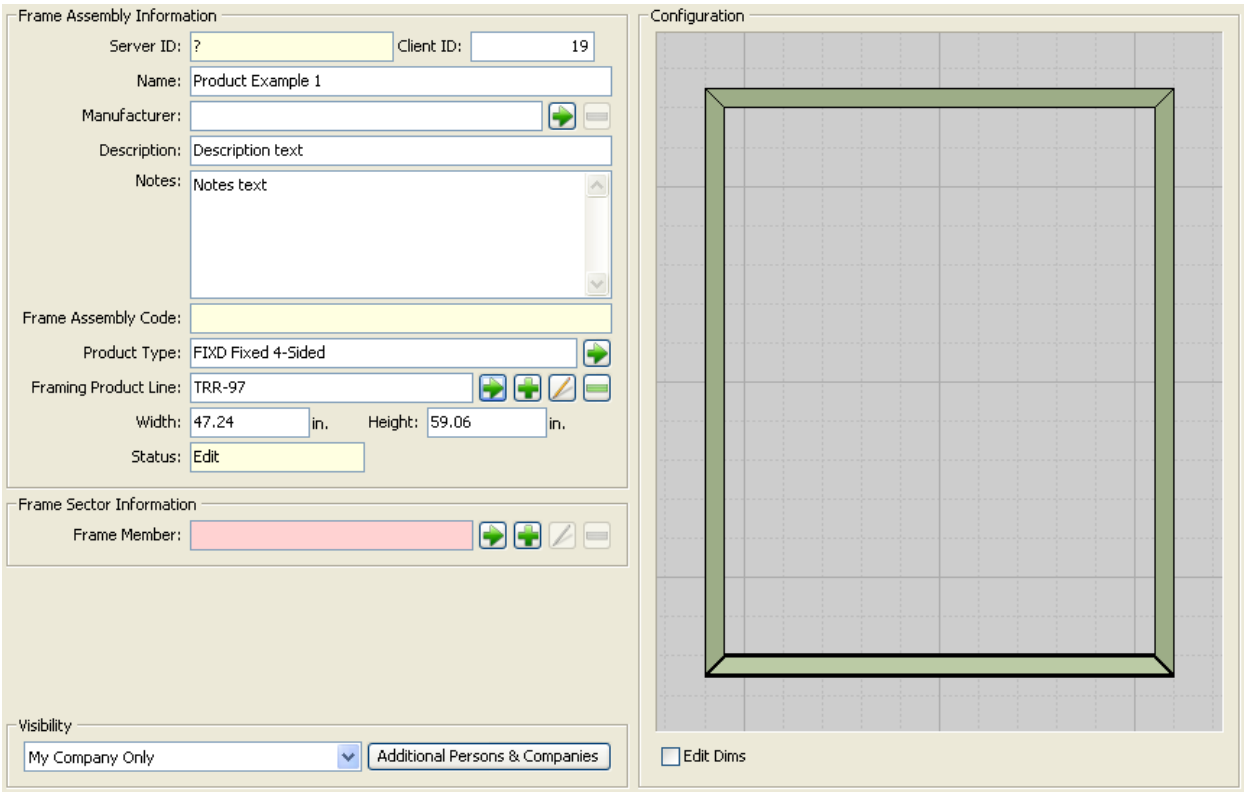
© 2010 National Fenestration Rating Council, Inc.



User also has an option to select Framing Product Line, which helps narrow down the choice of frame components. Namely, when the Framing Product Line is chosen, the list of frame components in the Frame Component selection screen will show by default only frame components with the same framing product line. Creation of new framing product lines is possible by clicking on the "**+**" button next to the Framing Product Line field; details about selected framing product line can be reviewed, but not edited by clicking on the next button in that group; while the framing product line selection can be removed using the "**–**" button. Preferred width and height of the frame assembly can be also defined in corresponding fields, and these dimensions will be used in subsequent product definition as default product dimensions. Alternatively, when the **Edit Dims** box below the **Configuration** area is checked, it is possible to change dimensions of the assembly by selecting particular frame members and dragging them in the desired direction.

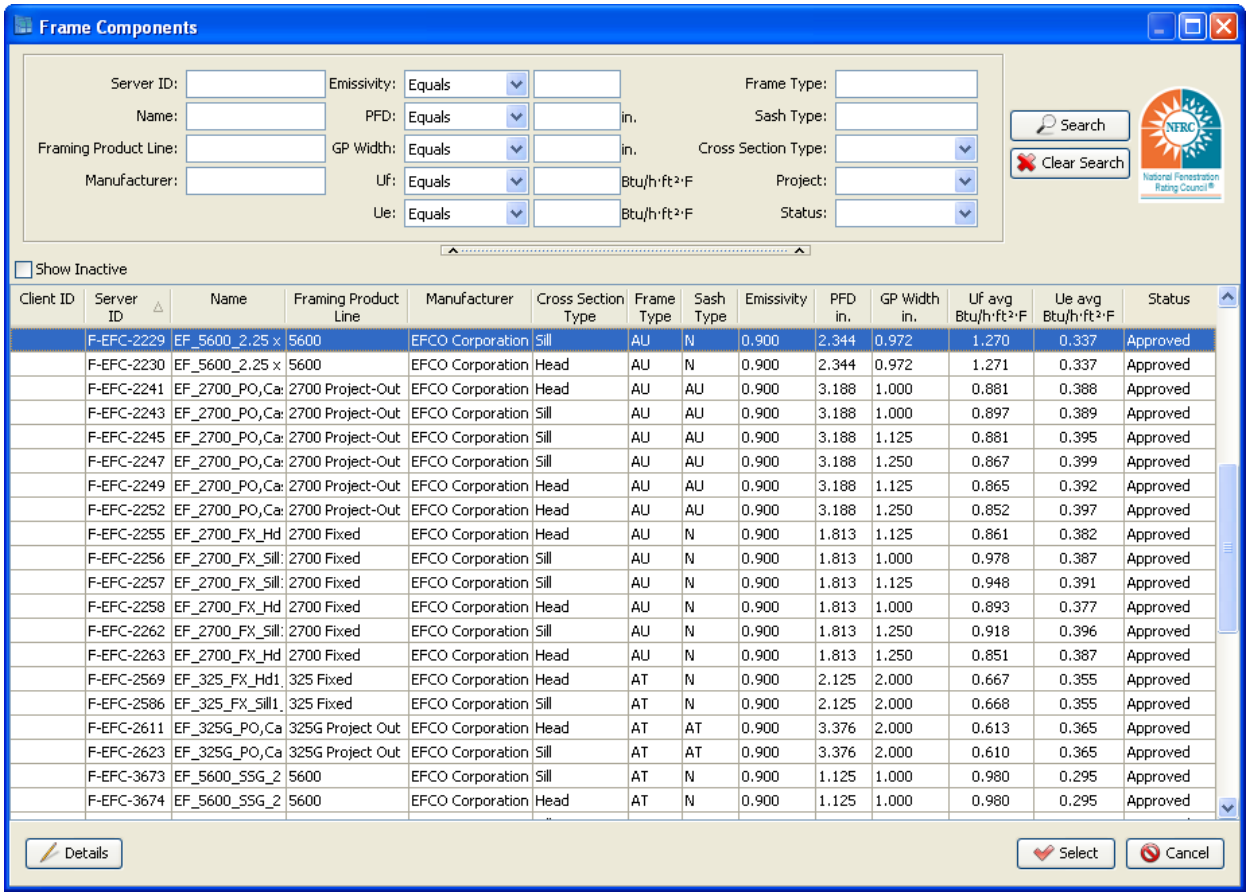
Frame component is assigned to frame member by clicking on the appropriate frame member in the **Configuration** area, which becomes outlined with heavy line, and selecting appropriate item from the Frame Component selection list screen, invoked by clicking on the 'arrow-button' next to the Frame Member field. User also has an option to create new frame component by clicking the "**+**" button. When frame component definition is completed, the new frame component is associated with the selected frame member.

© 2010 National Fenestration Rating Council, Inc.

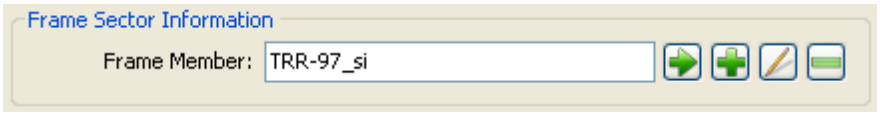


Selection list screen shows all compatible frame types and allows selection by either pressing OK or by double-clicking selected item in the list. Compatible frames are determined based on the position within frame assembly. For example, if jamb frame member is selected, only vertical frame components are displayed. Also, when meeting rail or mullion is selected, only frame component of that type are displayed. This prevents erroneous frame component selection.

© 2010 National Fenestration Rating Council, Inc.



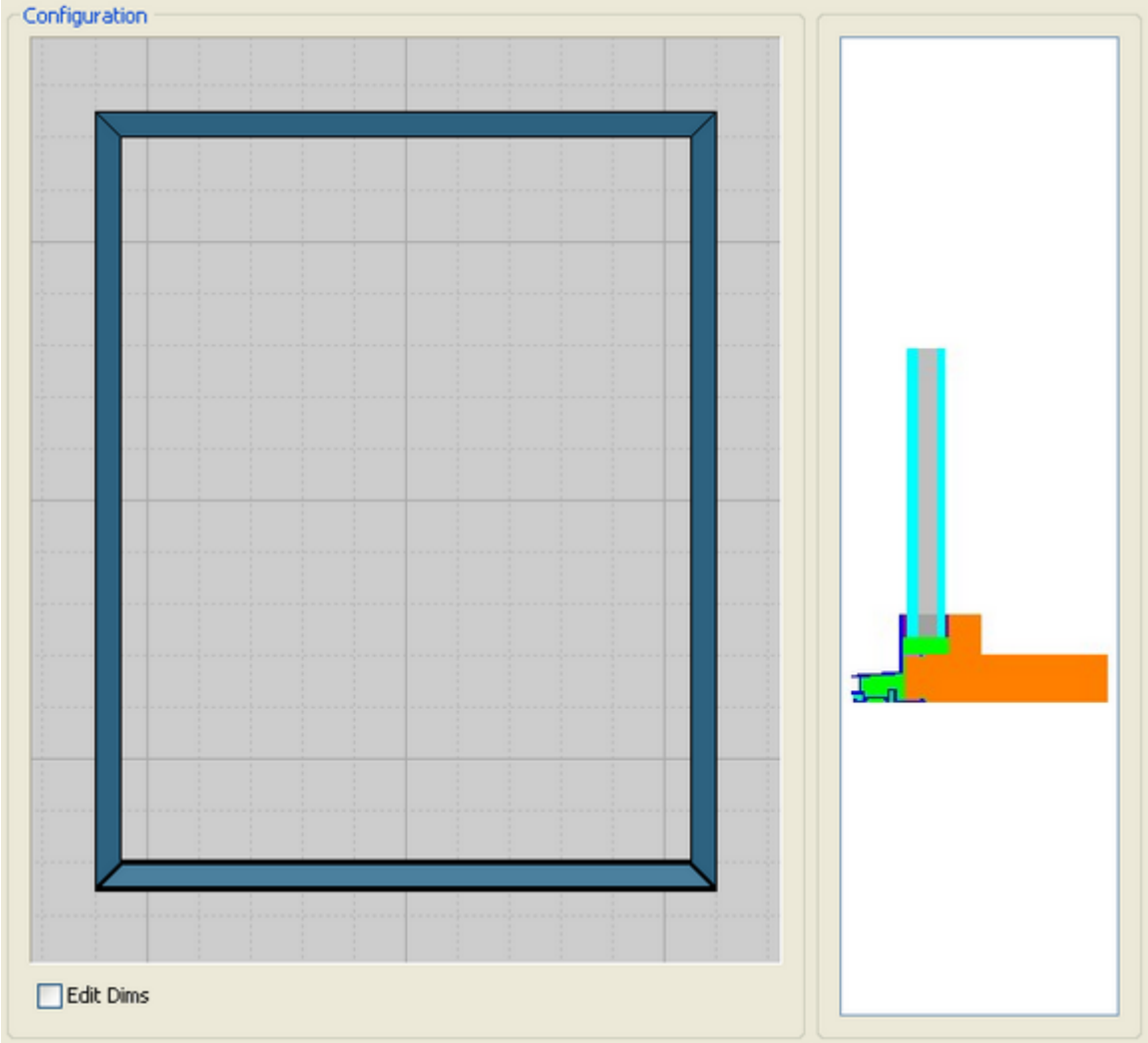
Once the frame component is selected, its name would be displayed in the Frame Member field. Then, user has an option to review the component details in a read-only screen by clicking on the third button in the group.



Association of the frame component for selected frame member can be removed by pressing the (–) button. In that case selection of frame member is reset and selection filed is again highlighted in red, while frame member in Configurator becomes light green again, indicating that no frame component is assigned to it.

It should be noted that after clicking on the particular frame member in the **Configuration** area, preview of the assigned frame component would be displayed in the right-most part of the screen only if the **Show Image** option is specified for the component (see Frame Component screen). Also, the Details option from the pop-up menu, available by right-click on the frame member in the **Configuration** area, opens read-only Frame Component details screen about the frame component assigned to the frame member.

© 2010 National Fenestration Rating Council, Inc.



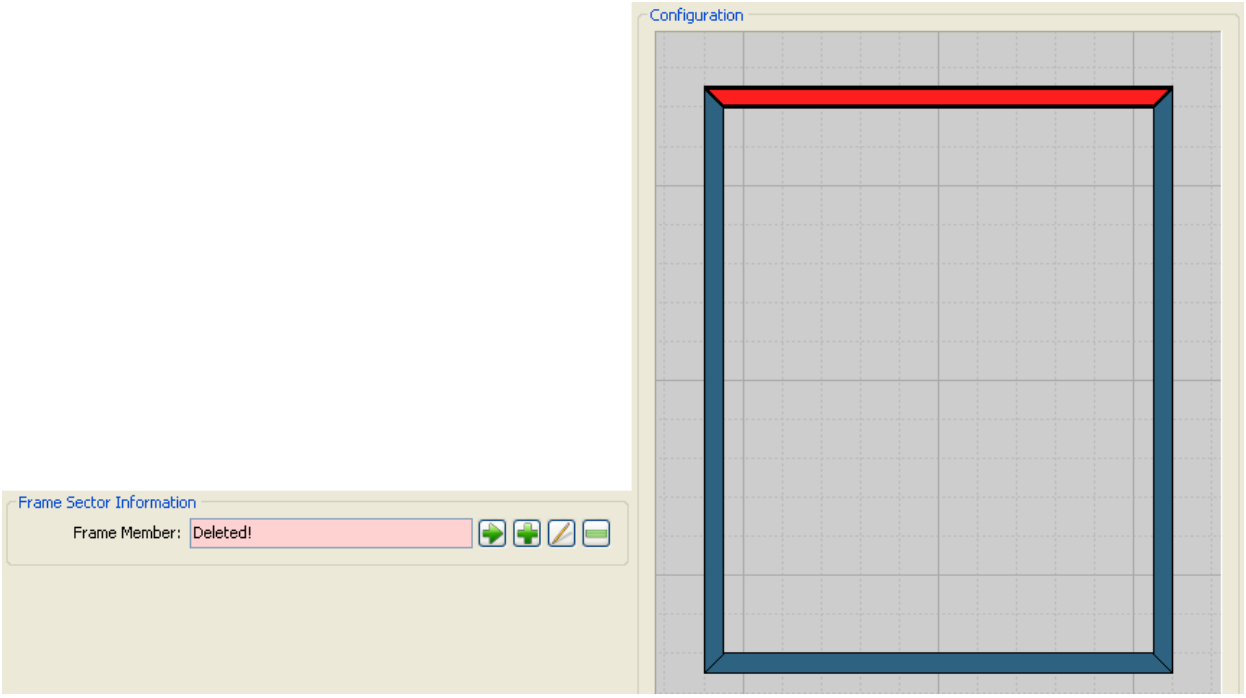
Frame assembly definition is completed once all frame members are defined. This is easily visually identifiable from the **Configuration** area, where defined frame members are shown in different color. Frame assembly does not contain any glazing infill other defined hole(s) where glazing infill will be placed once the product is defined from the frame assembly.

Final choice is to set frame assembly visibility. Similarly to frame components, all assemblies are by default visible only to the user that created them (Myself Only visibility). All other visibilities allow assembly upload to the server and made it available to the intended audience.

When frame component applied in the assembly is deleted, all frame members that the component was assigned to would be red-highlighted next time the assembly is opened, and appropriate information would be displayed in the **Frame Member** field. In that case user needs to select another frame component(s) in order to have frame assembly completely defined, so that it could be used in other products and projects. Note that the frame component is actually deleted only when parent frame assembly is in edit mode. If

© 2010 National Fenestration Rating Council, Inc.

the frame assembly is in locked mode (either due to being part of label certificate, or certified product), the frame component that was deleted from the list of frame components will still be part of the locked frame assembly, thus maintaining the integrity of the database.



It should be noted that changes made only in dimensions of existing frame assembly, without affecting the assembly structure, would not be applied to other frame assemblies and products that contain this particular assembly. Once a label certificate is generated, all of the referenced assemblies (including frame assemblies) become locked from further editing. These 'locked' frame assemblies can be used in subsequent products and projects as applicable. If a change in the locked frame assembly is required, a copy must be made of the assembly in order to make the necessary changes to it. This new assembly can then be used in a product.

For complex product types, additional options allow defining of simple frame assemblies within the complex assembly; inserting and/or removing mullions (in case of custom assembly) and common frames (in case of composite assembly); as well as changing layout and dimensions of complex assembly and simple assemblies it consists of. All of those options will be explained in following sections.

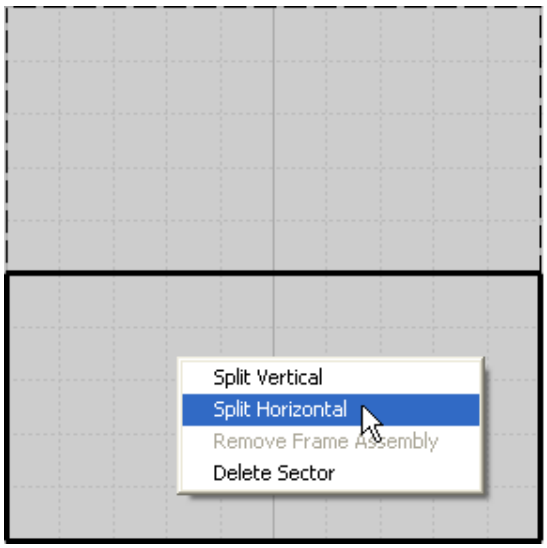
3.6.2.2 Custom Frame Assembly

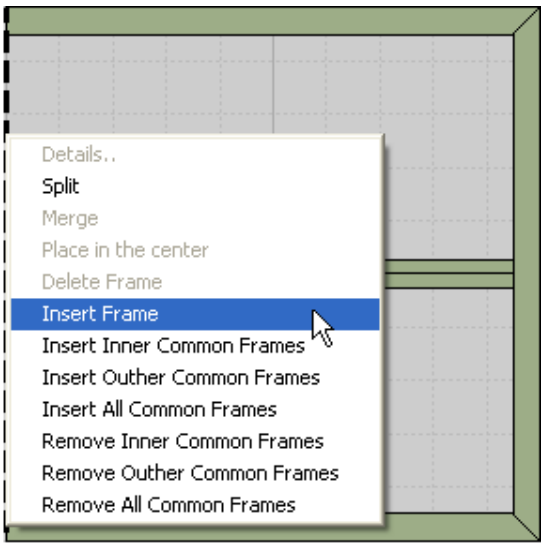
Custom type of the frame assembly is presented in the **Configuration** part of the screen as area, surrounded by dashed lines, which can be arbitrarily divided into numerous sub-sectors. That can be done using **Split Vertical** and **Split Horizontal** options from pop-up menu, accessible by right mouse click on selected sector of the assembly, and the menu

© 2010 National Fenestration Rating Council, Inc.

also has an option (Delete Sector) for removing selected sector. Please note that all of these pop-up menu options are available only if the **Edit Dims** box below the Configuration area is checked.

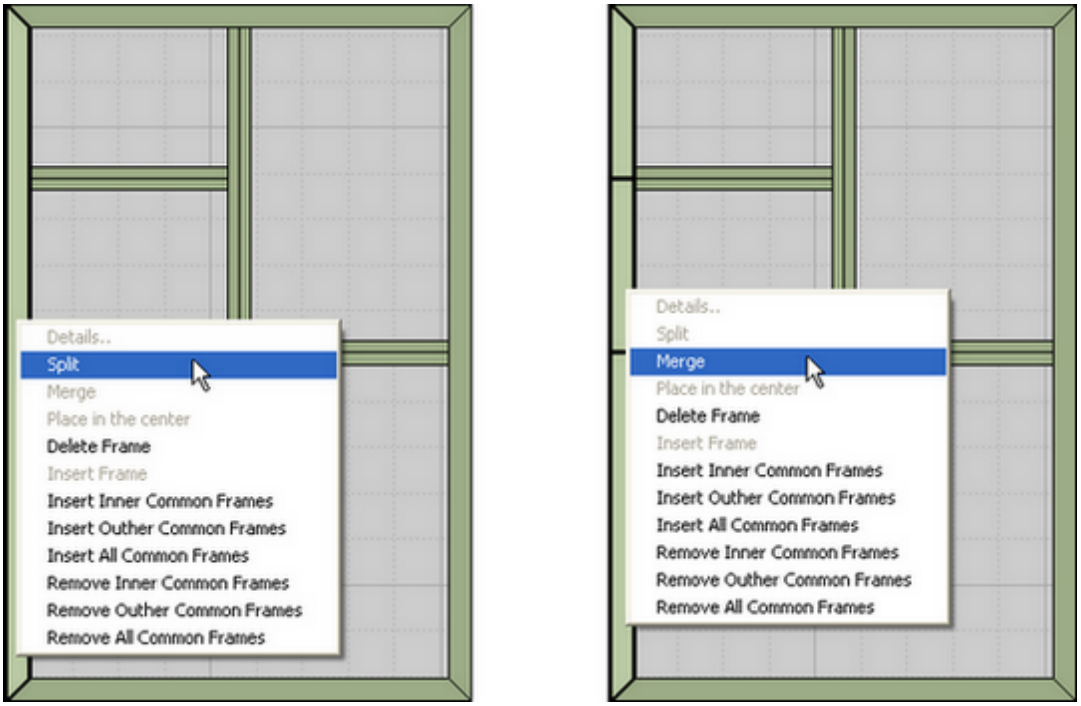
When the desired layout of the custom assembly is defined in this way, insertion of frame members can be done by right-click on dashed line in the layout and selecting the Insert Frame option (or Insert Mullion in case of mullion frame member).



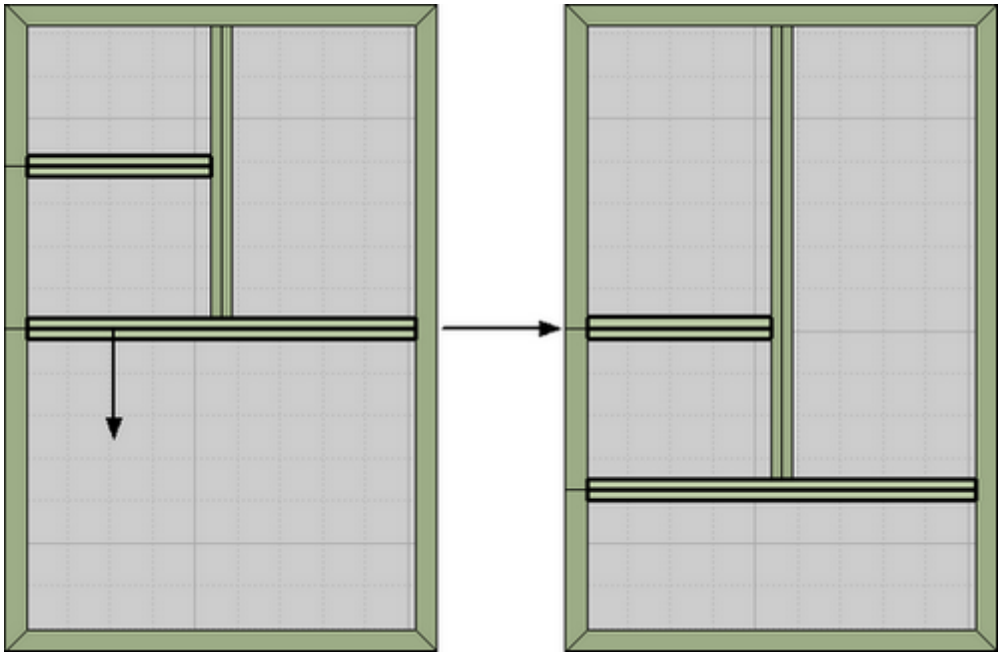


Once inserted, border frame members can be split and merged without restrictions using corresponding options from right-click popup menu, as shown in following figure. Mullions also can be split and merged, but with restriction that at least one of those that are crossing each other has to be continuous (i.e., both mullions cannot be broken at the point of intersection).

© 2010 National Fenestration Rating Council, Inc.



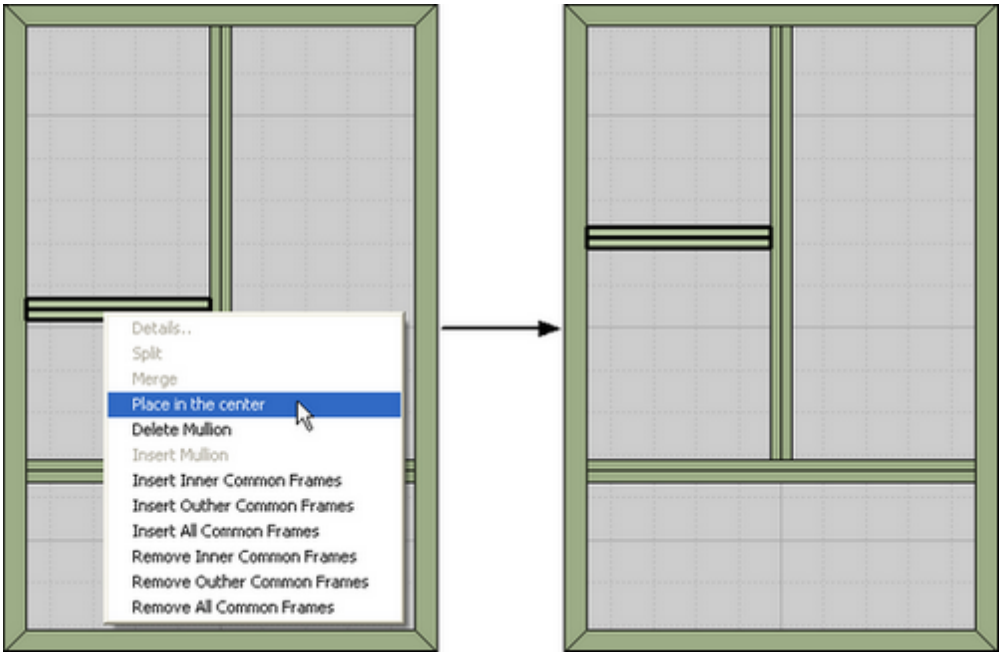
Moving frame members is possible by clicking on them and dragging in desired direction, but not closer to adjacent frame member than the minimum dimensions constraints. Also, selection of multiple parallel frame members using Shift-click option is enabled, so that they could be moved at the same time as necessary.



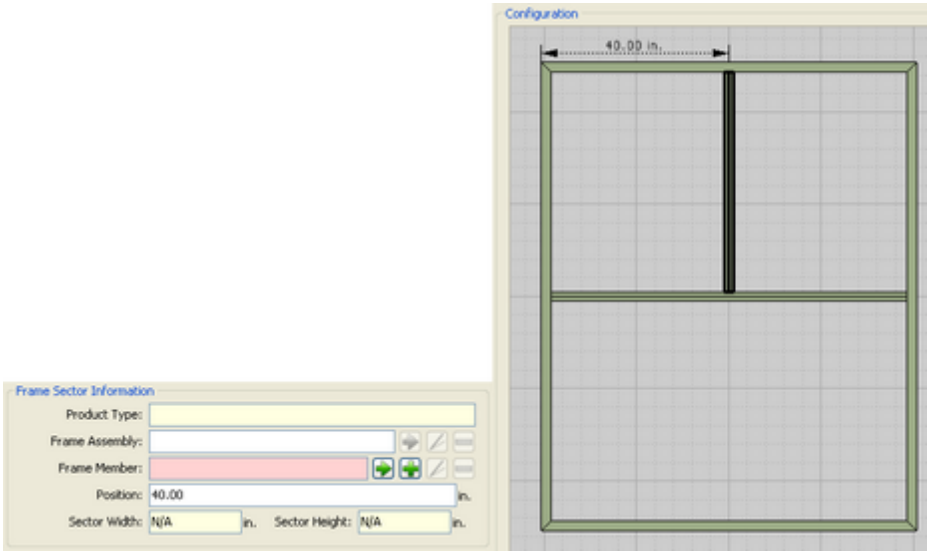
In addition, mullions can be positioned exactly in the middle between adjacent parallel frame members using corresponding option from the right click menu, which is shown in

© 2010 National Fenestration Rating Council, Inc.

following example.

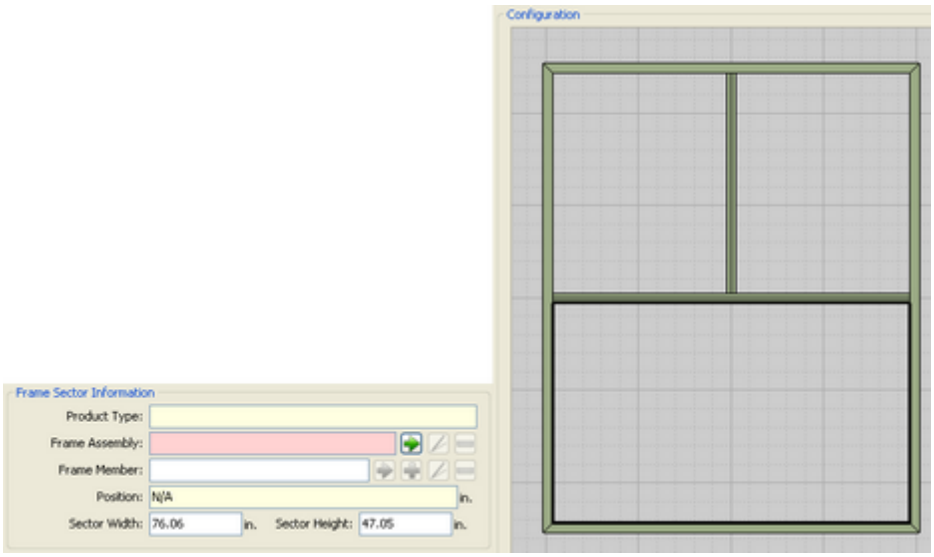


By selecting appropriate frame members and moving them in desired direction, particular sectors of the custom assembly can be manually resized, as well as the custom assembly as a whole. However, exact dimensions of sectors in the assembly can be specified in corresponding fields in the lower left part of the screen. Position of selected mullion frame member, measured from top left corner of the assembly, is displayed in the Position field, and it represents either horizontal distance in case of vertical mullion, or vertical distance in case of horizontal mullion. By changing the value, selected mullion will be moved accordingly and size of all sectors it separates will be reduced or increased depending on direction of movement.



© 2010 National Fenestration Rating Council, Inc.

At the same time, dimensions of selected custom assembly sector, displayed in the Sector Width and Sector Height fields, can be also changed as necessary. During resize, bottom left corner of the selected sector represents anchor point, meaning that bottom and left side of the sector will remain static, while right and top side will move accordingly.



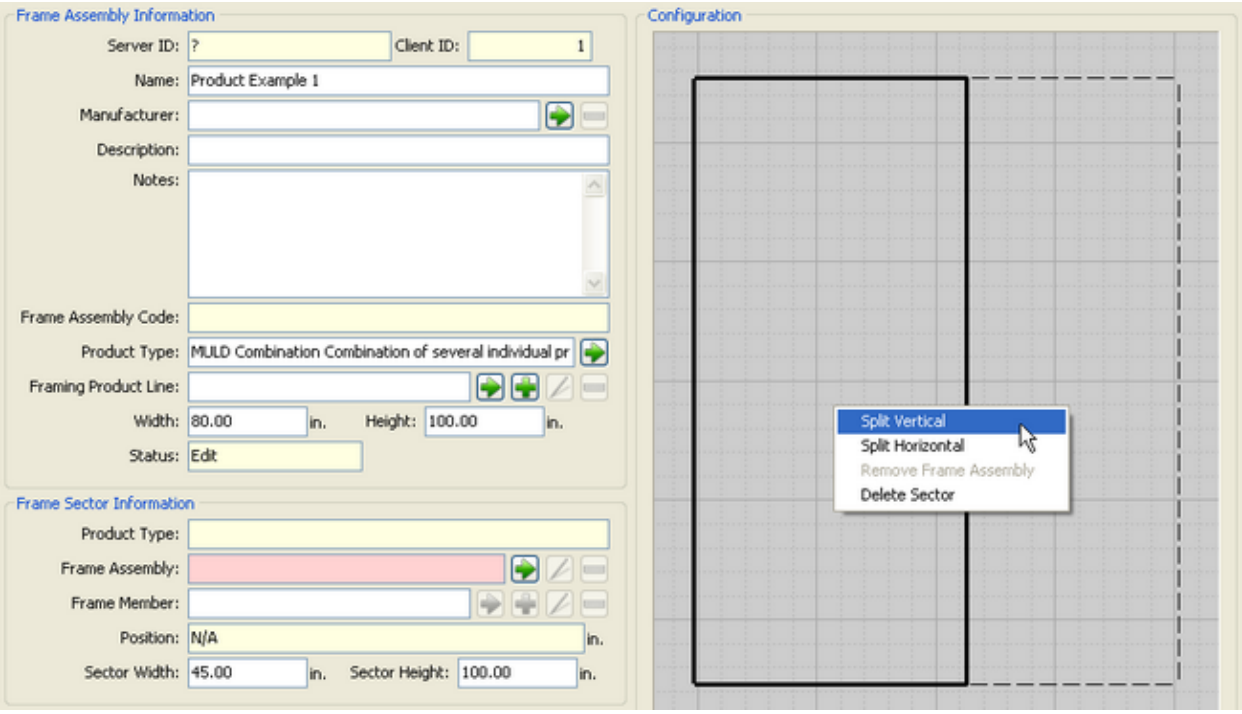
Therefore, changing dimensions of the sector, bounded on right and/or top side by border (i.e., outer) frame members, will affect overall custom assembly dimensions and, consequently, dimensions of all sectors next to the right and top border frame members. Otherwise, when the sector is not placed next to the right and/or top border frame members, its resizing causes changes only in dimensions of adjacent right and above sectors, while dimensions of other sectors and whole custom assembly remain the same.

Finally, numeric resize of whole custom assembly can be done by specifying desired dimensions in the Width and Height fields in Frame Assembly Information section. During the resize, proportions of the assembly as a whole will be maintained, which means that all inner parts will be moved accordingly.

3.6.2.3 Combination Frame Assembly

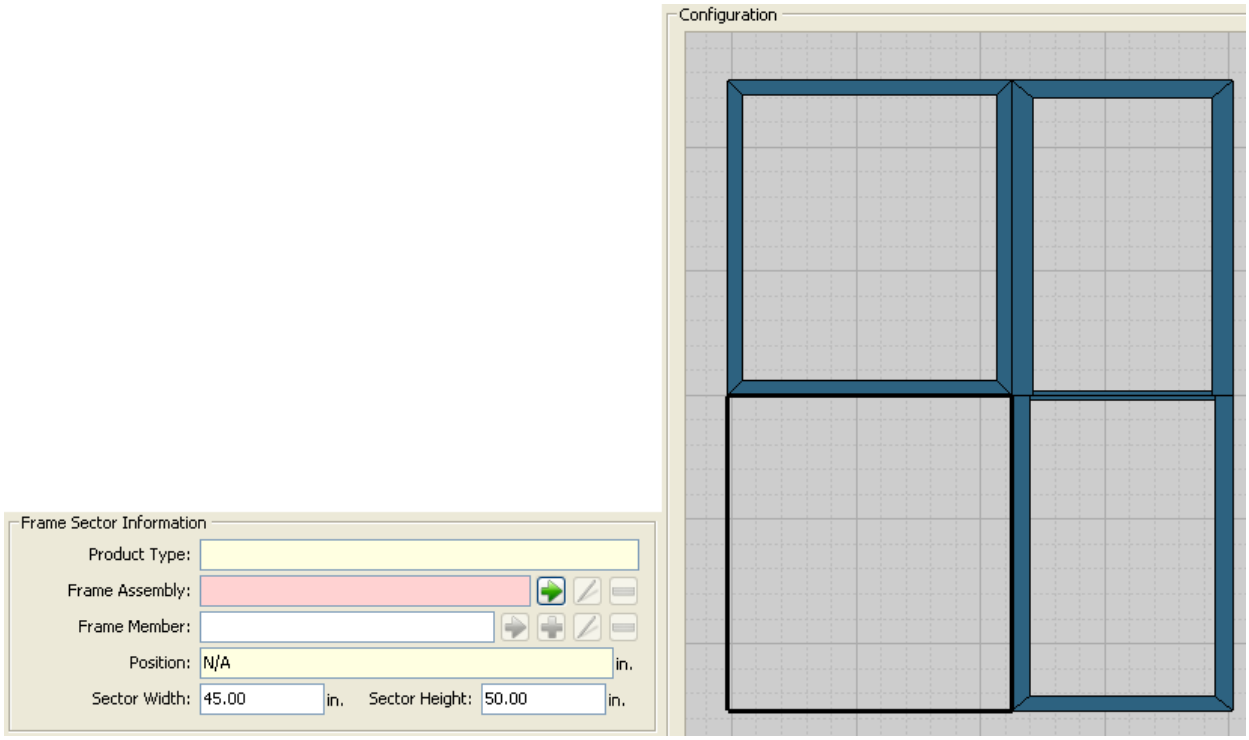
Combination frame assemblies consist of the two or more simple frame assemblies mulled together, and their basic (e.g. default) presentation in the **Configuration** part of the screen is an area surrounded by dashed lines and divided into two sectors, placed one next to another. As in case of custom assembly, further division of the combination assembly into sub-sectors can be done using the **Split Vertical** and **Split Horizontal** options from right click menu, while the **Delete Sector** option is intended for removing selected sector. Also, it is possible to specify dimensions of whole combination assembly and/or selected sector in corresponding fields before assigning simple frame assemblies to each sector, as appropriate.

© 2010 National Fenestration Rating Council, Inc.

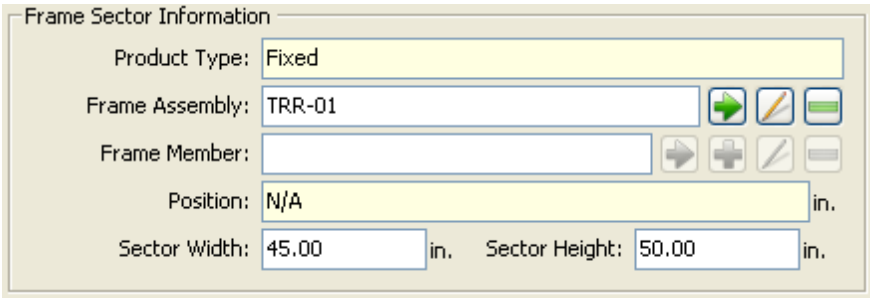


Once the layout of combination frame assembly and dimensions (optionally) are defined, simple frame assemblies can be assigned to sectors by clicking on each sector (which becomes outlined with heavy line) and selecting appropriate item from the Frame Assemblies selection list screen, opened by pressing the 'arrow-button' next to the Frame Assembly field.

© 2010 National Fenestration Rating Council, Inc.



After clicking on assigned simple (individual) frame assembly in the Configuration area, its name, type and dimensions would be displayed in corresponding fields. Also, if some frame component from the individual assembly is selected, it will be referenced in the **Frame Member** field.



It should be noted that changes in frame components of individual assemblies can be made only by selecting particular individual assembly in the Configuration area and opening it for editing using the second button next to the Frame Assembly field. Then user can make desired changes in the frame component(s), which will be afterwards reflected in the combination product. If the individual frame assembly had been used in label certificate(s), its structure cannot be changed (i.e., it is locked) and new frame assembly with modified structure needs to be created. That could be done by selecting one of the existing frame assemblies in the Frame Assemblies screen and copying it (if there are notable similarities). Combination product will then need to be updated to incorporate this new frame assembly.

Combination frame assembly can be converted into the composite assembly by right-click

© 2010 National Fenestration Rating Council, Inc.

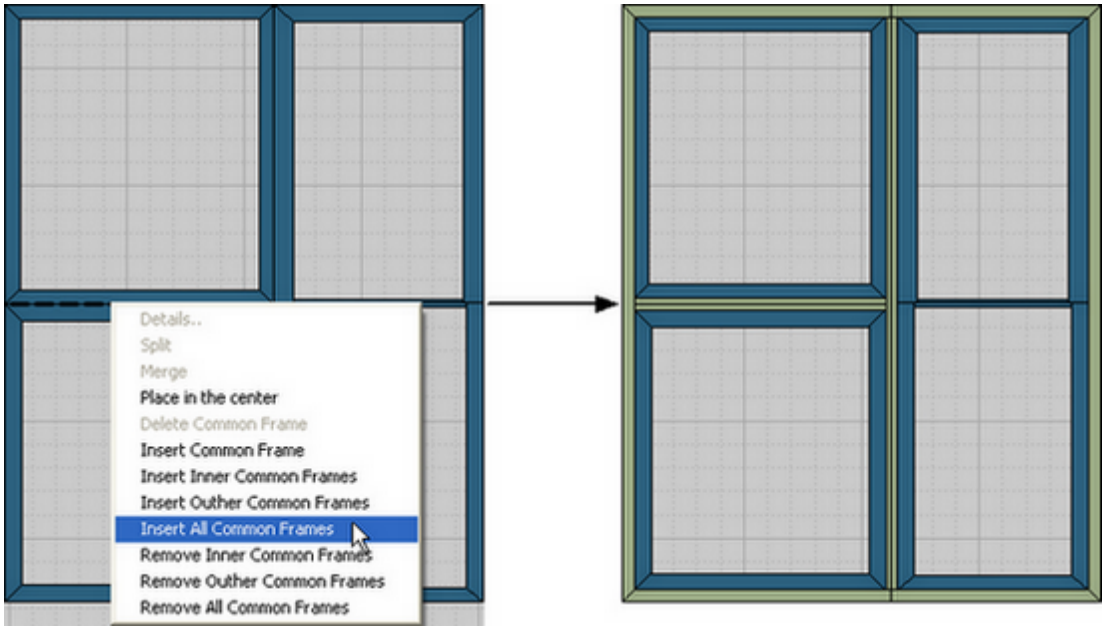
on one of the dashed lines, displayed between the individual assemblies and around them, and choosing one of available options from the pop-up menu. Those options are:

1. Insert Common Frame - for placing common frame only on selected position;

2. Insert Inner Common Frames - for placing common frames between individual (simple) assemblies;

3. Insert Outer Common Frames - for placing common frames around whole frame assembly;

4. Insert All Common Frames - for placing common frame profiles between all individual assemblies and around them.



3.6.2.4 Composite Frame Assembly

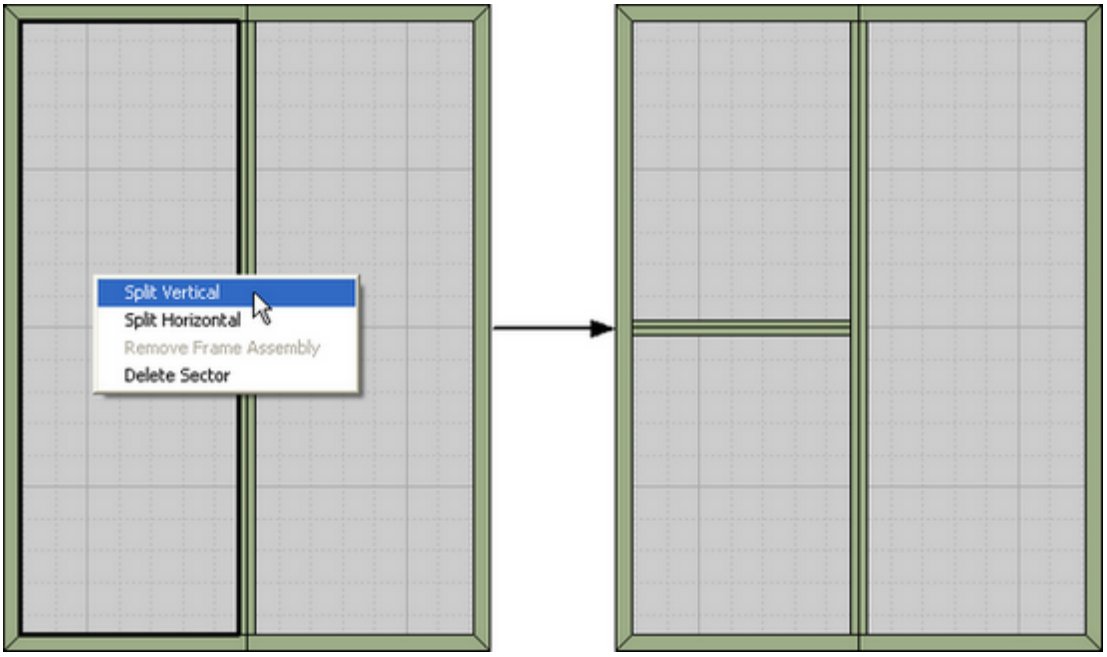
Composite frame assembly is a complex assembly that can consist of several simple assemblies connected together with additional framing profiles and with the optional framing profile placed around the whole assembly.

Framing profiles around simple assemblies and/or between them are called Common Frame members. The Common Frame members are special type of framing profile that do not include glazing system, and they are designed to join together simple assemblies into the composite frame assembly.

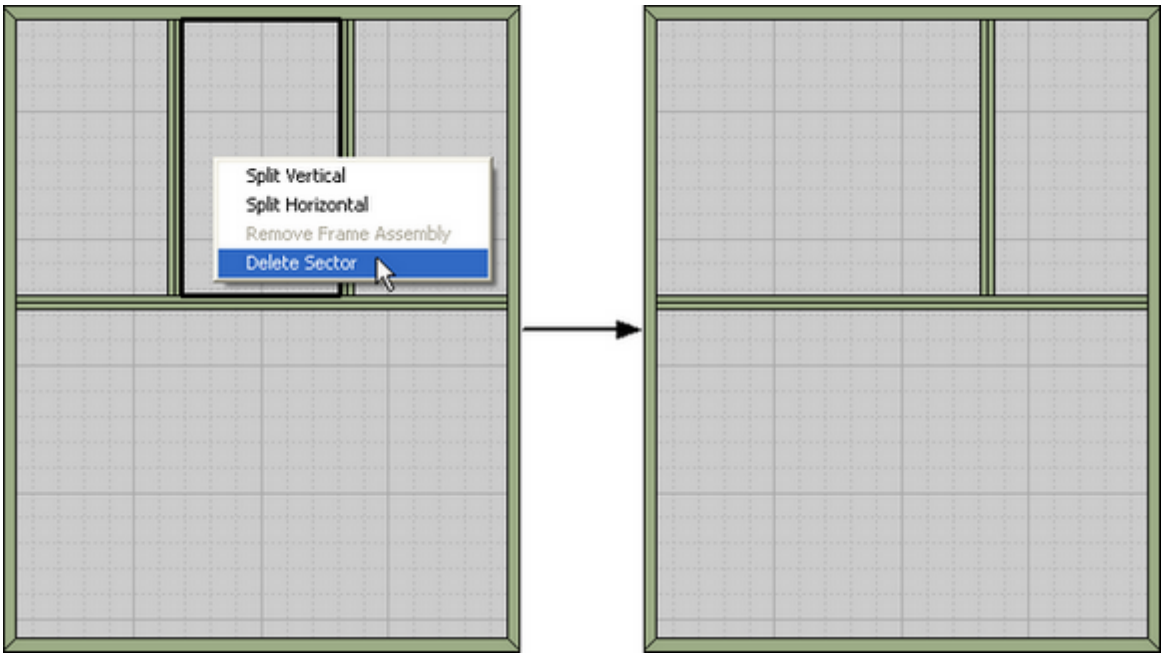
Basic (e.g. default) presentation of the composite frame assembly in the Configuration part of the screen consists of two sectors, placed one next to another, with common frame members between and around them. Creation of new sub-sectors in the composite assembly can be done by selecting one of the existing sectors and choosing appropriate option (Split Vertical or Split Horizontal) from right-click menu. Split Vertical option creates two sectors, placed above another, in selected area of the Configurator (as shown in

© 2010 National Fenestration Rating Council, Inc.

following figure), while Split Horizontal creates two sectors placed side-by-side.



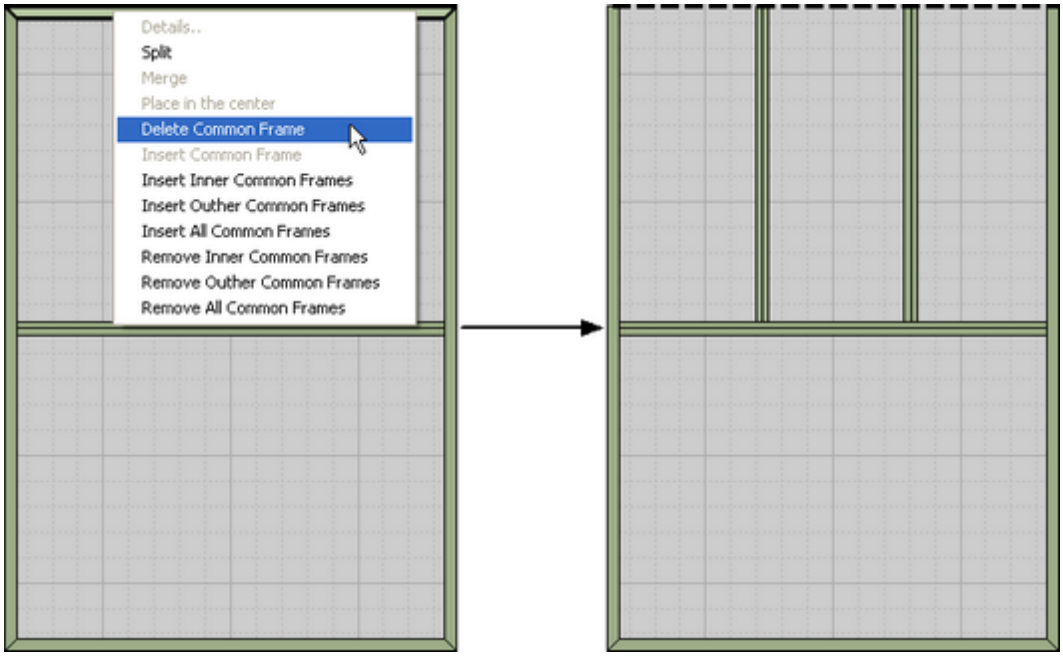
Each sector can be also removed from the composite assembly by right-click on it and selecting Delete Sector option from popup menu. In that case, one of the adjacent sectors will expand to fit space.



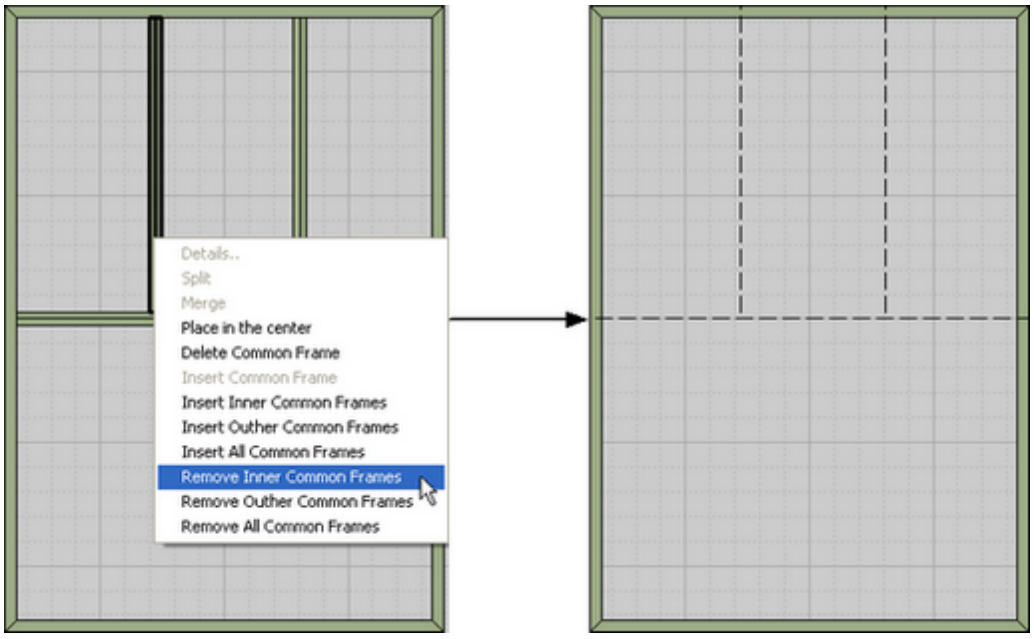
In addition to creation and deletion of sectors, layout of the composite assembly can be also changed by adding and removing common frame members. Each individual inner and outer common frame member can be removed by selecting it and choosing Delete

© 2010 National Fenestration Rating Council, Inc.

Common Frame option from right-click menu. After removal, location of the deleted common frame is indicated with dashed line.



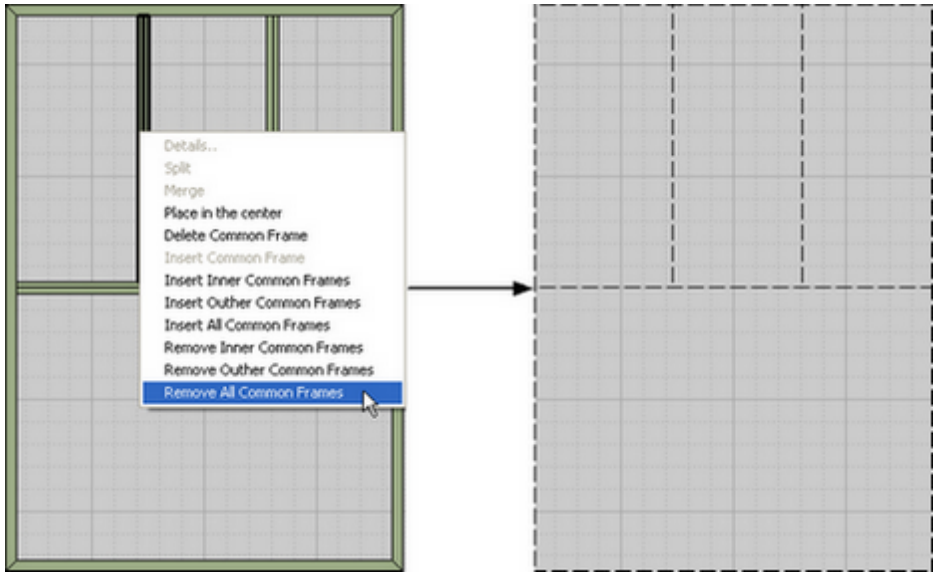
Pop-up menu, available by right click on inner or outer common frame, also has options (e. g., Remove Inner Common Frames and Remove Outer Common frames) for removing all inner and outer common frame members.



All inner and outer common frames can be removed at the same time using the Remove All Common Frames option from the right-click menu, and in that case composite

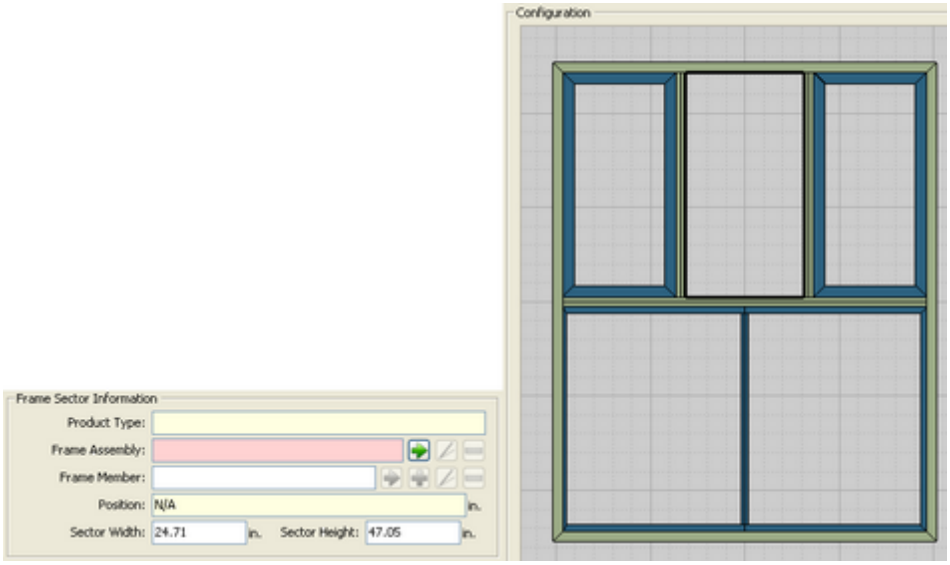
© 2010 National Fenestration Rating Council, Inc.

assembly will be automatically converted into combination assembly.



Similarly to mullions in custom assemblies, common frames can be moved by clicking on them and dragging into desired direction, causing changes in dimensions of individual assemblies which they connect together. Also, moving multiple common frames is possible by selecting them and using Shift-click option, while particular common frame can be positioned exactly in the middle between adjacent parallel frame members using the Place in the Center option from right-click menu.

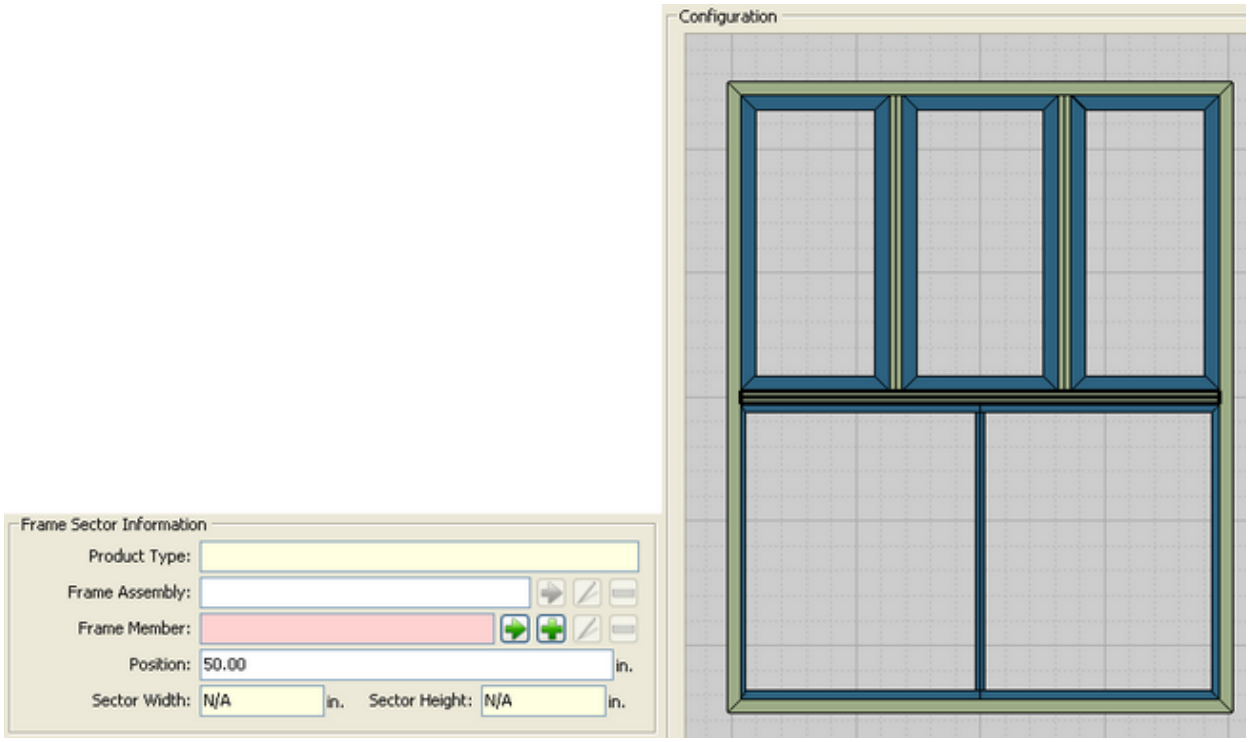
Simple frame assemblies are inserted into sectors by clicking on particular sector (which becomes outlined with heavy line) and selecting desired assembly from the list screen, opened by pressing the 'arrow-button' next to the Frame Assembly field.



Also, frame components can be assigned to each common frame member by clicking on

© 2010 National Fenestration Rating Council, Inc.

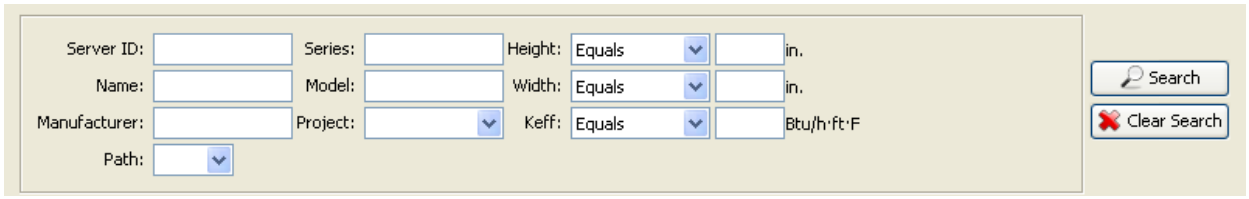
particular common frame and selecting the frame component using the 'arrow' button next to the Frame Member field.



3.6.3 Spacer Edge Seal Assemblies

Spacer Edge Seal Assemblies screen has options for creation of new spacer assemblies and storing them in the client database, as well as modifying the existing ones. The Spacer Edge Seal Assembly screen is accessible from **Spacer Edge Seal Assemblies** option from the Assemblies menu, or **Spacer Edge Seal Assemblies** button in the main screen toolbar.

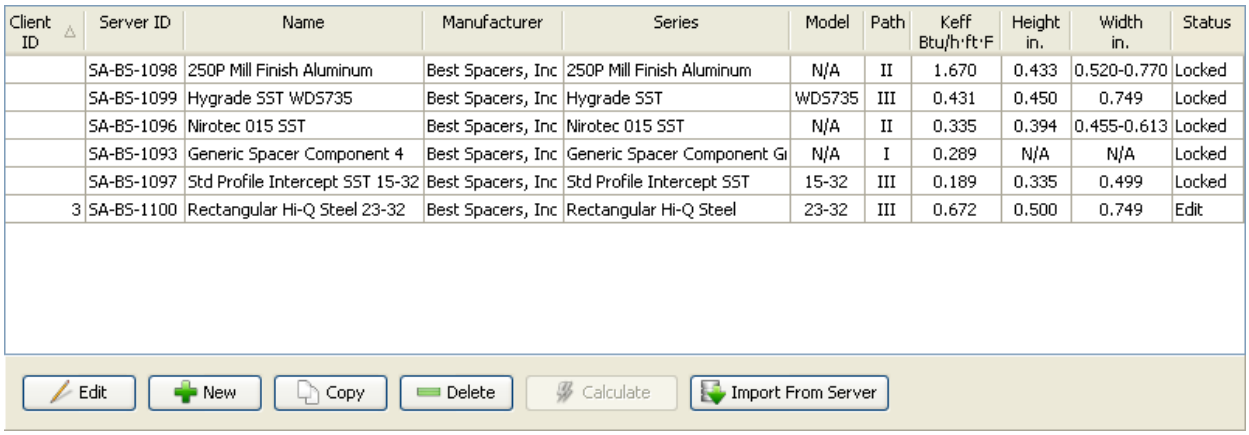
Users can search for specific spacer assemblies as per several criteria that are set in the upper part of the screen - server ID, spacer series, spacer assembly name, etc.



As in case of other list screens, summarized information about each record is presented in list form in the central part of the screen. This information includes spacer assembly name, manufacturer, series, model, definition path, effective conductivity (Keff), and assembly dimensions. Model name is available only for assemblies created per Path III, while

© 2010 National Fenestration Rating Council, Inc.

dimensions are shown for assemblies created in both Path II and Path III (for Path II, width is given as a range of values between smallest and largest model in the series). Finally, buttons below the list allow user to perform common tasks with the spacer assemblies in the client database as with other assembly and component list screens.



Client ID	Server ID	Name	Manufacturer	Series	Model	Path	Keff Btu/h·ft·F	Height in.	Width in.	Status
	SA-BS-1098	250P Mill Finish Aluminum	Best Spacers, Inc	250P Mill Finish Aluminum	N/A	II	1.670	0.433	0.520-0.770	Locked
	SA-BS-1099	Hygrade SST WDS735	Best Spacers, Inc	Hygrade SST	WDS735	III	0.431	0.450	0.749	Locked
	SA-BS-1096	Nirotec 015 SST	Best Spacers, Inc	Nirotec 015 SST	N/A	II	0.335	0.394	0.455-0.613	Locked
	SA-BS-1093	Generic Spacer Component 4	Best Spacers, Inc	Generic Spacer Component Gi	N/A	I	0.289	N/A	N/A	Locked
	SA-BS-1097	Std Profile Intercept SST 15-32	Best Spacers, Inc	Std Profile Intercept SST	15-32	III	0.189	0.335	0.499	Locked
3	SA-BS-1100	Rectangular Hi-Q Steel 23-32	Best Spacers, Inc	Rectangular Hi-Q Steel	23-32	III	0.672	0.500	0.749	Edit

Edit/Details - the **Edit** button is displayed only if selected spacer assembly has "Edit" status, and it opens Spacer Edge Seal Assembly screen with options for modifying the spacer assembly; otherwise, the **Details** button is displayed and no data can be changed in the read-only Spacer Edge Seal Assembly screen that is starts;

New - opens empty Spacer Edge Seal Assembly screen, so that new assembly can be created;

Copy - creates a copy of selected spacer assembly;

Delete - remove selected spacer edge seal assembly from the client database;

Import From Server - copies assemblies, which have been synchronized to the server for sharing, to the local client database.

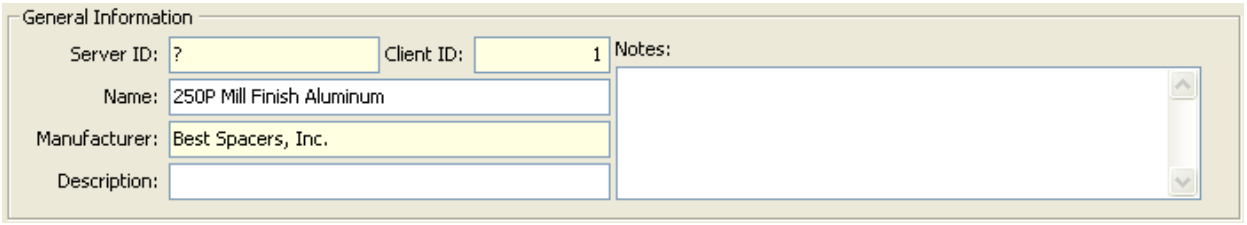
3.6.3.1 Spacer Edge Seal Assembly Screen

Spacer Edge Seal Assembly details screen is intended for the definition of new spacer edge seal assemblies and for reviewing/editing existing assemblies in the client database. A new assembly creation is started by pressing the **New** button in the Spacer Edge Seal Assemblies screen, while for editing an existing assembly select the desired assembly in the Spacer Edge Seal Assemblies screen and press the **Edit** button, or double-click on that assembly.

The **General** group-box is always displayed at the top of the screen, regardless of the definition path, with fields for the client and server ID, spacer assembly name, manufacturer name, description and notes. Client ID is automatically assigned as soon as the assembly creation is started, while the server ID remains empty until the assembly is uploaded to CMAST server database via synchronization. Name of spacer edge seal assemblies consisting of components created according to Path I or Path II is

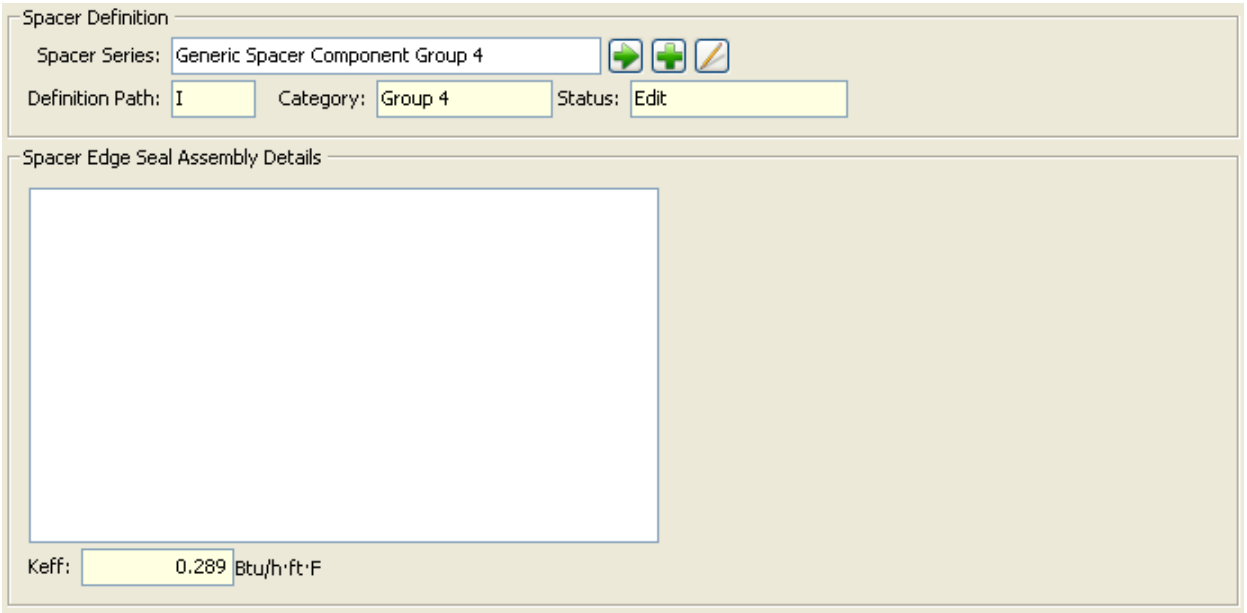
© 2010 National Fenestration Rating Council, Inc.

automatically set to be equal as spacer component series name, while the name of assemblies defined in Path III includes model name in addition to the component series name (for example, 250P Mill Finish Aluminum 7-16). At the same time, name of spacer component manufacturer is automatically set as the spacer edge seal assembly manufacturer.



Layout of the area below the **General** group-box is changeable based on the definition path (e.g., Path I, Path II, or Path III) for the spacer component that the assembly is configured from.

For **Path I**, spacer edge seal assembly is generated automatically from the spacer component, but alternatively the user can create new spacer edge seal assembly by clicking on the 'green arrow' button and selecting the appropriate Path I spacer component. When the component is selected, the series name, definition path and spacer category are immediately input into the corresponding fields, as well as effective conductivity (Keff) value.



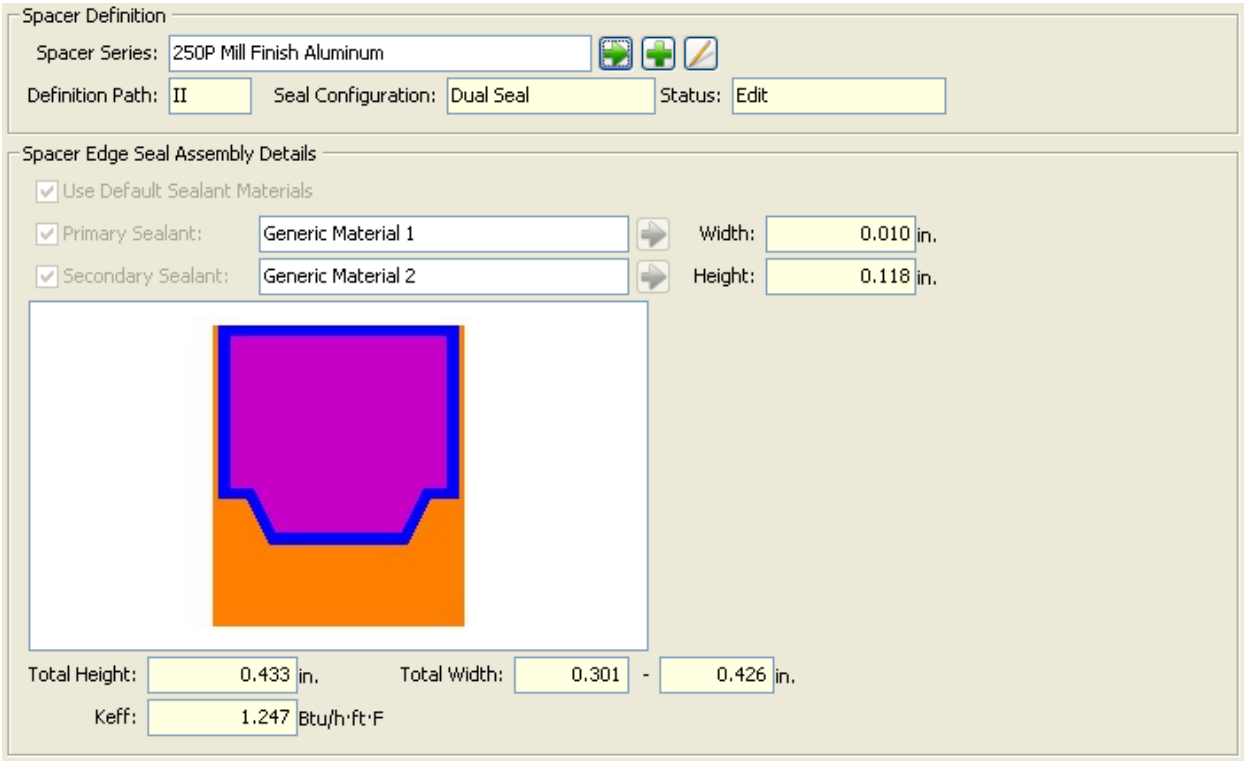
In case of definition **Path II**, spacer edge seal assembly is also created automatically from the spacer component. But, the user can also create a new assembly by selecting the appropriate spacer component from the component list opened by clicking on the 'green arrow' button. Upon the spacer component selection, corresponding fields are automatically filled with spacer series name, definition path, and seal configuration.

© 2010 National Fenestration Rating Council, Inc.

Generic sealant materials are used in spacer edge seal assemblies defined in Path II, and they are listed in the following table.

Spacer Sealant Materials	Sealant Conductivity (W/m-K) / (Btu/hr-ft-F)
Generic Sealant 1	0.25 / 0.144
Generic Sealant 2	0.40 / 0.231

The “Generic Sealant 2” material is applied in a single-sealant spacer edge seal assembly system, while in a dual-sealant system the “Generic Sealant 1” material is used for the primary sealant and “Generic Sealant 2” for the secondary sealant. Sealant dimensions are shown in corresponding fields, and the width is set to 0.010” (0.25 mm), while the secondary sealant height is set to 0.118" (3.0 mm). Width of the assembly is defined as a range between smallest and largest model in the series. Therefore, in single-sealant configuration where primary sealant is not considered, total width range is equal to the width values of the smallest and largest spacer component model. As generic sealant materials and dimensions are used, all controls except selection ('arrow') button are disabled, including fields for overall spacer assembly height and width, and Keff value.



Unlike definition Path I and Path II, **Path III** spacer edge seal assemblies are not automatically created from the spacer components. The user needs to choose appropriate Path III component from the Spacer Components list; the spacer series name, definition path and seal configuration are then displayed in the corresponding fields. Also, the first model (size) within the selected spacer component will be displayed in the **Model** combo-

© 2010 National Fenestration Rating Council, Inc.

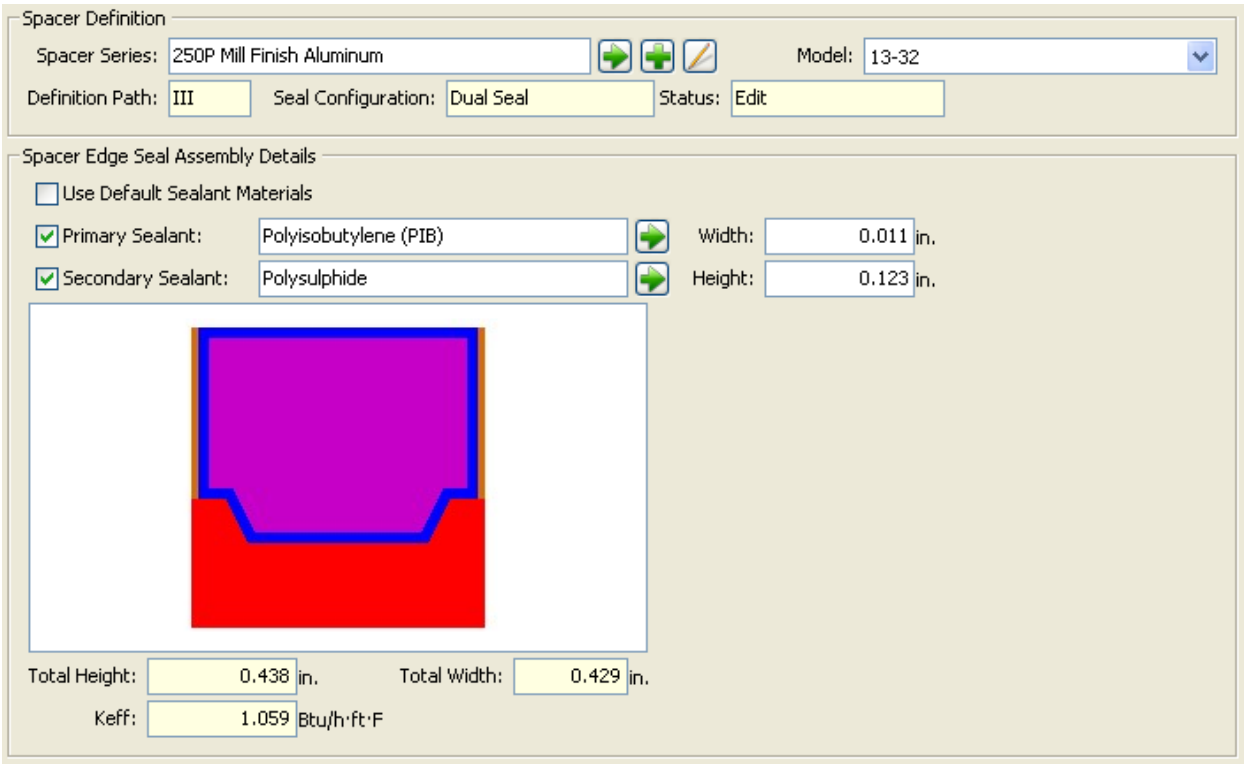
box as the default choice for the assembly. The model selection can be changed by choosing another size from a drop-down list, and the spacer assembly name that consists of component series name and model name will be automatically updated to reflect that change.

If the sealant configuration of the selected spacer component is other than "No Sealants", the user also has ability of defining the sealant materials and dimensions. In the case of a "Single Seal" configuration, that can be done for the secondary sealant, and in the case of a "Dual Seal" configuration for both primary and secondary sealant. If the compatible primary/secondary sealants are specified during spacer component definition according to Path III, then first materials from these lists will be offered as default choices. At the same time primary and secondary sealant dimensions are taken from the THERM model that was used for the spacer component creation. When these dimensions are being changed, the **Min** and **Max Thick** values, specified during spacer component definition according to Path III, are used as limits only if the sealant materials are in the compatible sealants list; just a warning is issued if those limits are exceeded. Values that the user specifies are accepted until it exceeding the absolute maximum thickness for overall spacer width (500mm), or is outside the following range for sealant dimensions - 0.03mm (absolute minimum); 10mm (absolute maximum).

Usage of default sealant materials is also possible by checking the corresponding box. In this case, the default primary and secondary sealant materials are applied, and their names displayed in the edit boxes. The selection of the sealant materials is disabled, and the user can only set primary sealant width and secondary sealant height. Limits for dimensions are again maximum for overall spacer width (500mm), and minimum and maximum values for sealant dimensions (0.03mm and 10mm, respectively).

Finally, when spacer component with "Single Seal" or "Dual Seal" configuration is selected, it is also possible to modify seal configuration of the spacer assembly by removing sealant(s). In case of the "Single Seal" configuration, secondary sealant can be removed, while in case of "Dual Seal" configuration both primary and secondary sealant are removable by de-checking corresponding boxes. Once the primary and/or secondary sealant is removed, overall dimensions (i.e., width and/or height) of the spacer assembly will be updated accordingly, as well as its preview image.

© 2010 National Fenestration Rating Council, Inc.

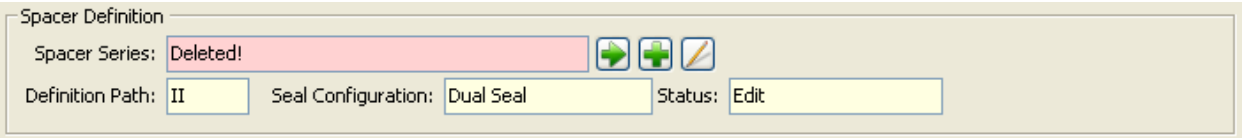


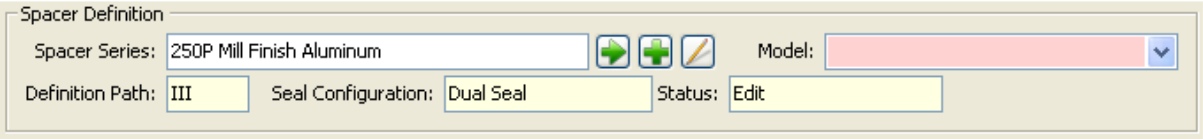
When the spacer edge seal assembly is completely defined as per Path III, its effective conductivity (Keff) can be determined by pressing the **Calculate** button. CMAST client application also automatically performs Keff calculation when the assembly creation is completed, and user tries to close the **Spacer Edge Seal Assembly** screen by pressing the **OK** button before calculating Keff. It should be also noted that every change in selection of the spacer model, as well as sealant configuration, materials and dimensions will reset previously calculated Keff value to zero.

Preview image of the spacer edge seal assembly, created as per Path II, or Path III, is taken from associated spacer component, and therefore it would be displayed only if that is defined during the spacer component creation (see Spacer Component screen).

When entire spacer component, or model size (in case of components defined according to Path III) that the spacer edge seal assembly consists of is deleted, all referenced data, including effective conductivity (Keff), would be erased next time the assembly is opened. Also, the **Spacer Series**, or **Model** field would be highlighted as indication for user that another spacer component must be selected in order to get completely defined frame assembly.

© 2010 National Fenestration Rating Council, Inc.



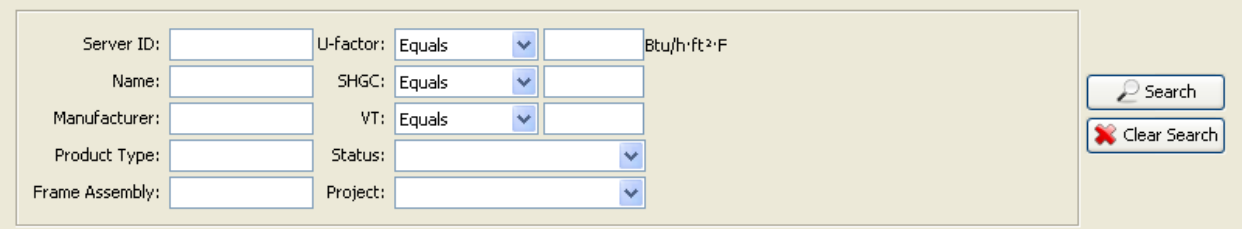


Like center-of-glazing and frame assemblies, spacer edge seal assemblies used in a project submitted for a label certificate, as well as in a baseline product for framing product line validation, will become locked from further edits. These spacer assemblies can be still applied in other products and projects, but no modifications can be made to them. Changes can be made only in a copy of the locked spacer edge seal assembly, and this new assembly can be used in products and projects.

3.7 Products

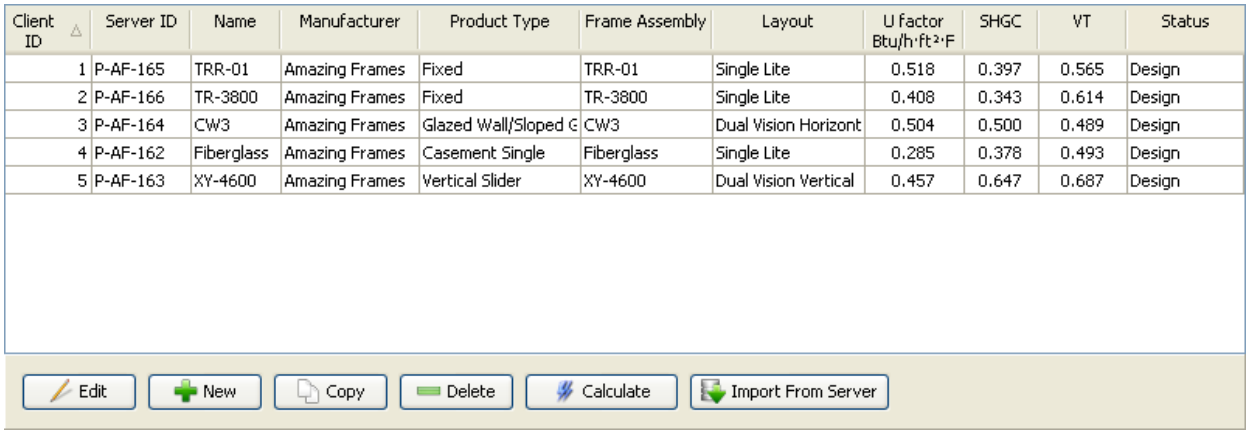
Products screen can be used for reviewing existing products in the client database, but it also provides options for editing products and adding the new ones. It can be invoked using **Products** option from the Products menu, or the **Products** button in the main screen toolbar.

Tools for filtering products in the library, consisting of series edit and combo-boxes, are placed in the upper part of the screen.



Central part of the screen contains information about each product in the database, including its description, type, frame assembly it consists of, and main thermal indices, in tabular form, while the buttons at the bottom of the screen are intending for manipulating products in the database.

© 2010 National Fenestration Rating Council, Inc.



Client ID	Server ID	Name	Manufacturer	Product Type	Frame Assembly	Layout	U factor Btu/h·ft²·F	SHGC	VT	Status
1	P-AF-165	TRR-01	Amazing Frames	Fixed	TRR-01	Single Lite	0.518	0.397	0.565	Design
2	P-AF-166	TR-3800	Amazing Frames	Fixed	TR-3800	Single Lite	0.408	0.343	0.614	Design
3	P-AF-164	CW3	Amazing Frames	Glazed Wall/Sloped G	CW3	Dual Vision Horizont	0.504	0.500	0.489	Design
4	P-AF-162	Fiberglass	Amazing Frames	Casement Single	Fiberglass	Single Lite	0.285	0.378	0.493	Design
5	P-AF-163	XY-4600	Amazing Frames	Vertical Slider	XY-4600	Dual Vision Vertical	0.457	0.647	0.687	Design

Edit/Details - if selected product is in the "Edit" status, displayed **Edit** button starts Product screen where is possible to modify the product; otherwise, the **Details** button opens the Product screen as read-only and no data can be changed there;

New - opens empty Product screen, so that new product can be created from scratch;

Copy - creates a copy of selected product;

Delete - removes selected product from the database;

Calculate - performs calculation for selected product(s). It should be noted that multiple products can be selected by holding Shift/Ctrl key and clicking on appropriate items from the list, so that after clicking the **Calculate** button calculation is performed for all of them.

Import From Server - copies products that have been synchronized to the server for sharing to the local client database.

3.7.1 Product Screen

Creation of new products, modification of existing ones, as well as products submitting for validation, can be performed through the **Product** details screen. It is accessible by clicking the **New** button in the Products screen, by selecting a product in the Products screen listing and clicking the **Edit** button, or double-clicking on the selected product in the Products screen listing.

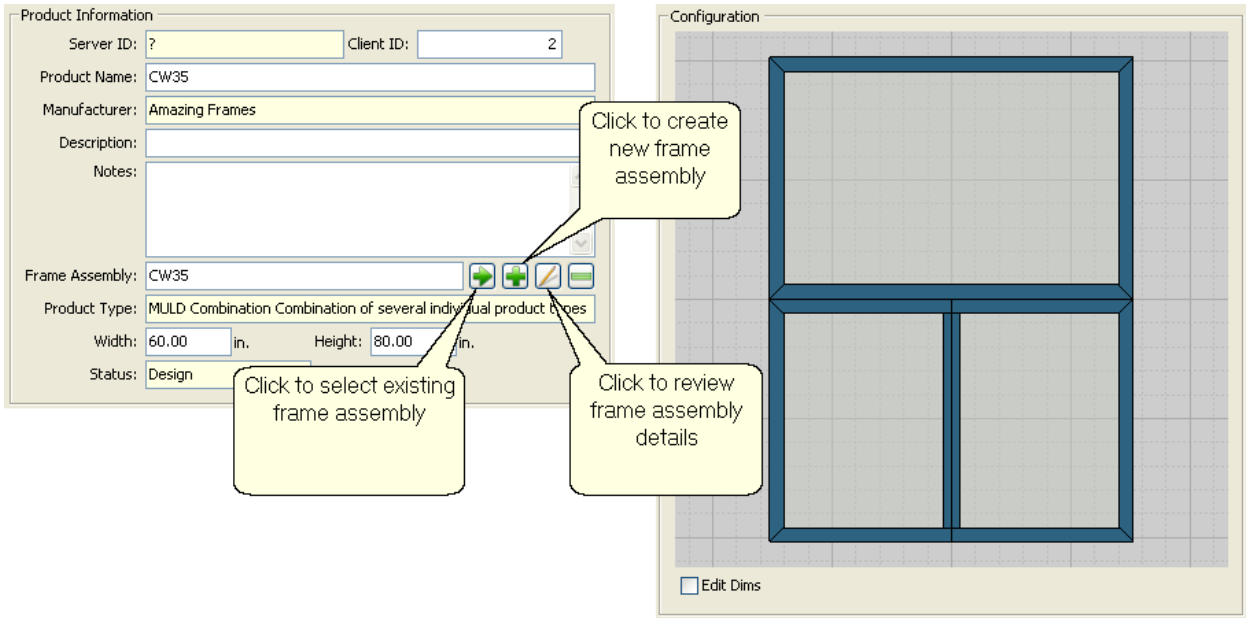
Creation of both simple (e.g., Casement, Fixed, etc.) and complex products (e.g., Custom, Combination and Composite) is possible in the CMAST client application, and therefore options for separate definition of data about the product and elementary assemblies, which it consists of, are provided in the Product Information and Component Selection for Individual Product sections, respectively.

The **Product Information** group-box is used for specifying product name, description and notes, as well as selection of frame assembly, which the product would consists of, from the list opened by clicking on corresponding ”Green Arrow” button. If the frame assembly that user wants to apply does not exist in the client database, it is possible to create it in the Frame Assembly screen, accessible by clicking the "**+**" button. Details of selected

© 2010 National Fenestration Rating Council, Inc.

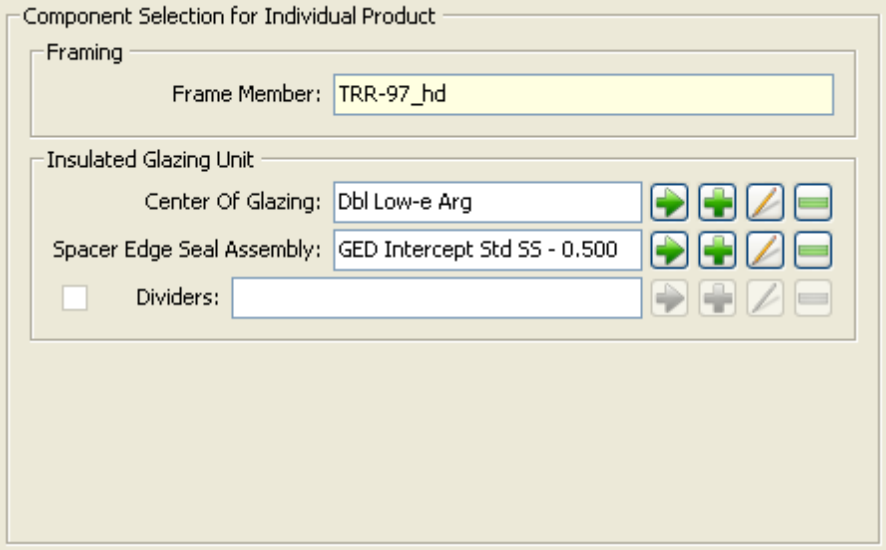
frame assembly can be reviewed in a separate screen opened upon pressing the third button in the row next to the Frame Assembly field, and it should be noted that there is not possible to make any change in the frame assembly. Finally, selection of frame assembly can be removed using the "**–**" button.

When the frame assembly is selected, its layout is shown immediately in the Configuration area, while the product type and manufacturer, product type and default dimensions are automatically displayed in corresponding fields. If necessary, user can change product dimensions either by typing-in desired values in the Width and Height fields. Alternatively, when the **Edit Dims** box is checked product dimensions can be changed by moving its bounding frame members in the **Configuration** area.

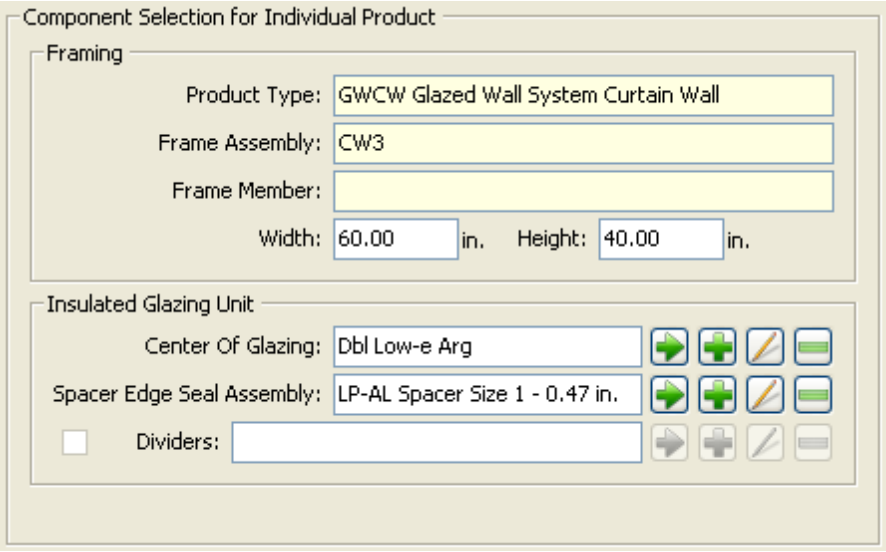


Layout of the **Component Selection for Individual Product section** depends on the type of the frame assembly that is assigned to the product. In case of simple assembly, name of particular frame component in the assembly, selected in the **Configuration** area by left mouse click, is displayed as read-only in the Framing section. At the same time, center-of-glazing and spacer edge seal assemblies applied to the product are shown in the Insulated Glazing Unit section. Selection of the center-of-glazing and spacer edge seal assemblies is made from lists opened by clicking on corresponding 'arrow' buttons. If necessary, new center-of-glazing and spacer assemblies can be made in a separate screens upon clicking the "**+**" button and applied to the product. As for frame assembly, details of selected center-of-glazing and spacer assemblies are available for review, but not for editing, after pressing corresponding buttons (i.e., the third button in rows next to the fields with center-of-glazing and spacer assemblies names), while the selection of center-of-glazing and spacer assemblies can be removed using the "**–**" button.

© 2010 National Fenestration Rating Council, Inc.

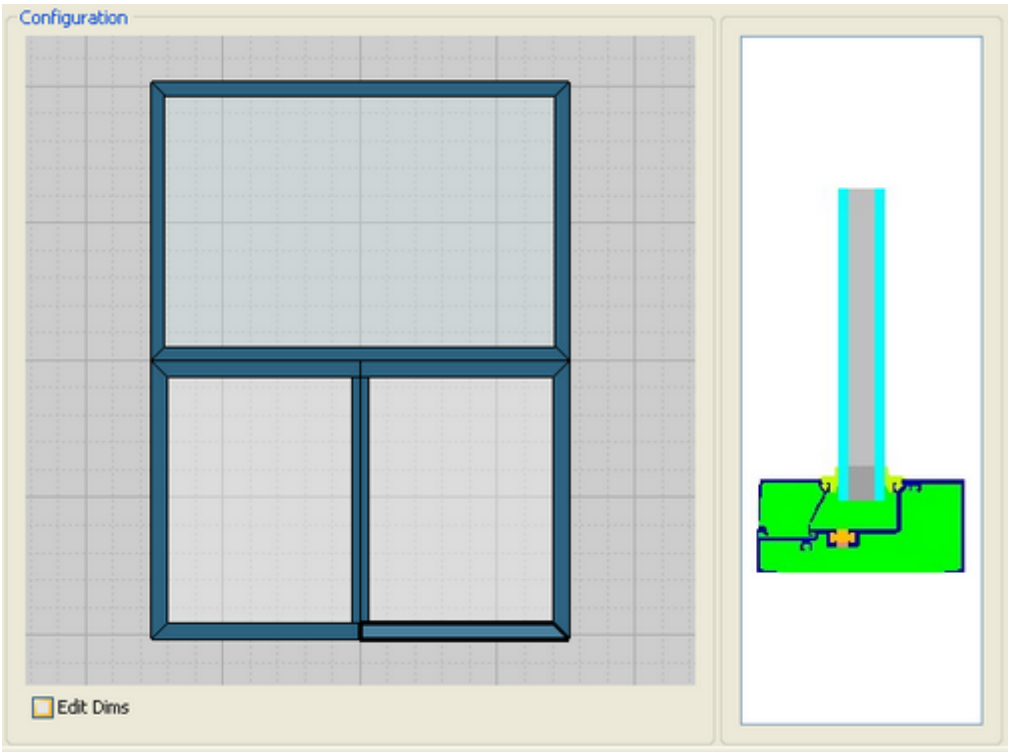


For complex assembly, Framing section shows elementary (simple) assembly, selected in the **Configuration** area, its product type and dimensions, and name of frame member (if the one is selected in the Configuration area). In this case, data presented in the Insulated Glazing Unit section refer to center-of-glazing and spacer edge seal assemblies applied to individual (elementary) product, selected in the **Configuration** area.

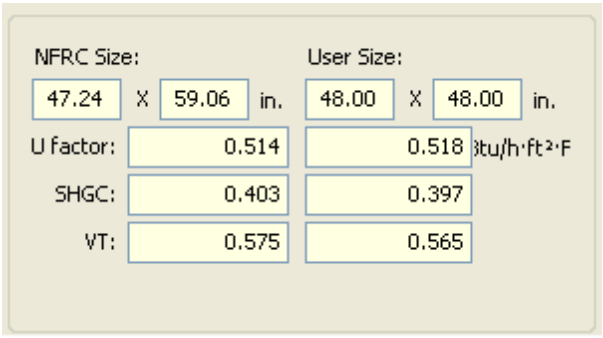


Also, when some frame member in the assembly is selected in the Configuration area, which is indicated with heavy outline, 2-D preview of the assigned frame component is displayed in the right-most part of the screen. But, that is possible just in case the preview displaying is specified for the component.

© 2010 National Fenestration Rating Council, Inc.

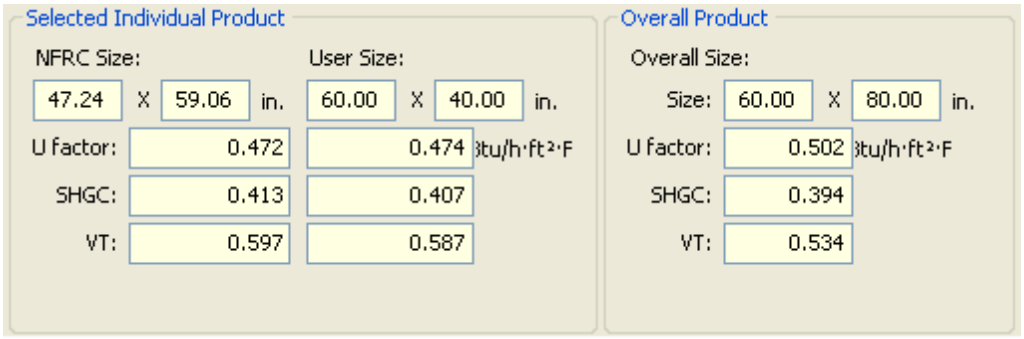


When product is completely defined, its main thermal indices are calculated after pressing the **Calculate** button, and the results are shown in the upper right part of the screen. For simple products, indices (i.e., U-factor, SHGC, VT) are displayed for both user defined size and NFRC size standardized for type (i.e. casement, awning, horizontal slider, etc.) of that particular product.

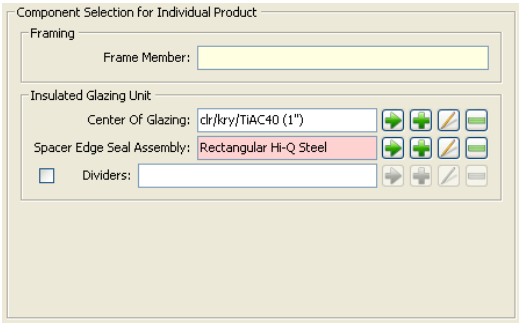


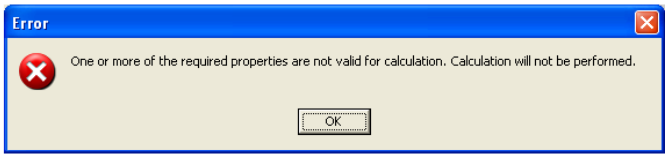
In case of complex products, the results are presented separately for the selected individual product and the overall product. Results for the individual product are given for both NFRC and user defined size.

© 2010 National Fenestration Rating Council, Inc.



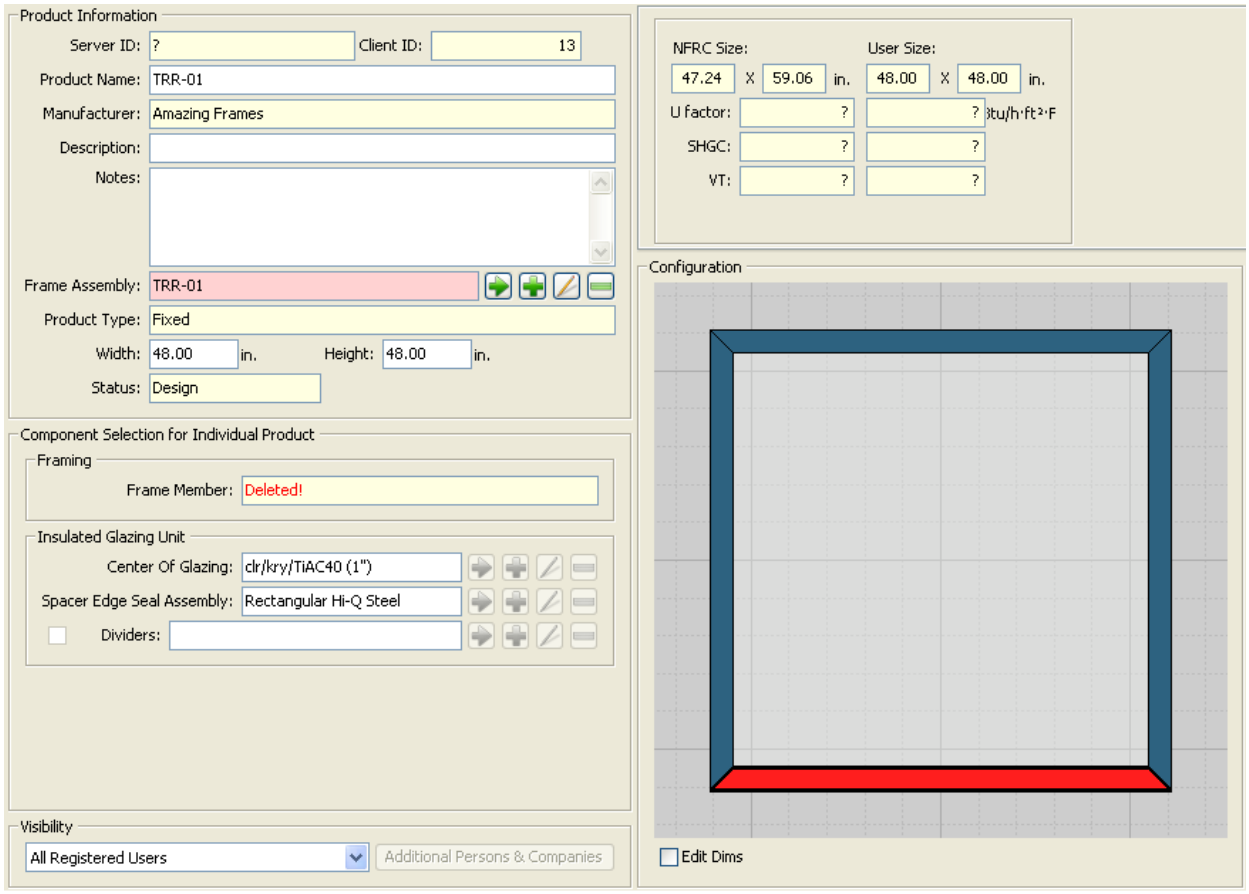
If some component, or assembly (center-of-glazing, spacer, frame, etc.) that the product consists of does not contain all the necessary data required for calculation of product indices, it will be indicated as invalid, and corresponding field(s) in this screen will be highlighted. Also, appropriate message would be displayed if user clicks on the **Calculate** button.





When any of the components or assemblies, applied in the product, is deactivated (deleted), it is also reported as invalid for calculation, and whole product indices would be erased next time the product is opened. In that case, fields for components/assemblies with invalid properties are highlighted, while deleted (deactivated) components/ assemblies are indicated with appropriate information (e.g. 'Deleted') in corresponding fields. In addition, if frame component is deleted (deactivated), all frame members that it was assigned to would be red-highlighted in the **Configuration** area.

© 2010 National Fenestration Rating Council, Inc.



All products included in a project would be locked upon the project submitting for label certificate. These products can not be modified, but can be applied in other projects. Desired changes can be made only in a copy of the locked product, which then can be further used in other projects. 'Locked' products can be also deleted (deactivated), in which case they would be unavailable for further use, but would remain in a label certificate where they were used.

When all components and assemblies that the product consists of contain all data required for calculation of product indices, EnergyPlus report for the product, as well as Doe2 report, can be created using corresponding buttons at the bottom of screen and saved in text format.

3.7.2 Baseline Product

For validation of framing product line it is necessary to create product the represents baseline for the framing product line and submit it for validation. Baseline product is created in CMAST Client application, and can only be submitted by Simulator in

© 2010 National Fenestration Rating Council, Inc.

Responsible Charge (SIRC). In order to be submitted for validation, baseline product must satisfy the following criteria:

1. New framing product line, which is the subject of validation, needs to be defined with both Manufacturer and IA assigned, and with status Design. Also, an existing framing product line can be used, but it cannot be in Validated or Validation status (i.e., not already validated, or submitted for validation).
2. All Spacer and Glazing Layer components used in this product must be either in Approved, Design or Locked status. They cannot be in Review or Redesign status.
3. All frame components used in the baseline product must be either in Design, Redesign, Review, or Pending status, and need to be assigned the framing product line that is submitted for validation (i.e., framing product line from step 1).
4. Frame assembly for the baseline product must be assigned the framing product line that is submitted for validation (i.e., framing product line from step 1).

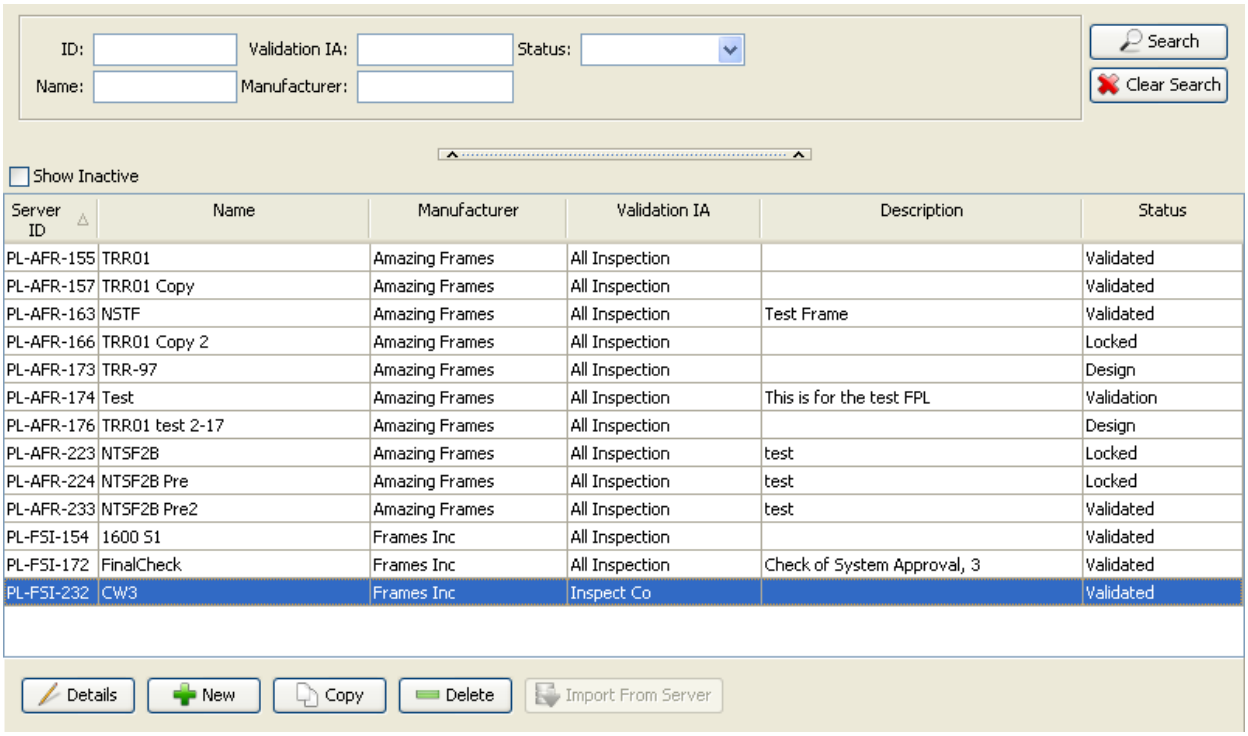
Baseline product also needs to have valid results (i.e., main thermal indices). If the requirements are not satisfied, after clicking the **Submit for Validation** button on Product Edit screen user will be informed that the product cannot be submitted for validation, and fields containing invalid properties will be highlighted. Otherwise, the product, the framing product line and all contained objects (assemblies and components) are uploaded to the server and acquire Server IDs if not previously assigned. The baseline product receives status “Validation”, which is equivalent to the Review status for components, and it becomes locked for editing while under review, and the same applies to components and assemblies that it consists of. Baseline product cannot be used for label certificates, but such products can be copied or can be imported (if the visibility allows) and used in label certificates, if the product contains all approved components.

3.8 Framing Product Lines

Framing Product Lines (i.e., collections of framing sections whose cross-sections can be grouped using the applicable grouping rules for non-residential products) are provided in CMAST client application, and they can be used as a convenient filtering criteria, so that only frame components belonging to selected framing product line are displayed. This can be very useful when hundreds or thousands of frame components are available in frame component library. Note that the use of framing product line is mandatory in definition of frame component that would be submitted for review, as well as in definition of frame assembly that would be applied in product submitted for validation and in project submitted for label certificate.

Listing of all framing product lines in the client application database is presented in the Framing Product Lines screen. It can be invoked using **Framing Product Lines** choice from the Products menu, or **Framing Product Lines** button in the main screen toolbar. There is possible to filter the framing product lines according to their ID, name, validation IA, manufacturer and status, as well as to sort them by clicking on corresponding grid column headers.

© 2010 National Fenestration Rating Council, Inc.



Buttons at the bottom of the screen are provided to enable certain operations with framing product lines in the database:

Details/Edit - if the selected framing product line has "Design" status, the **Edit** button is displayed, and it opens Framing Product Line screen where the framing product line name, description, manufacturer and validation IA can be changed; otherwise all relevant information about the framing product line can be just reviewed in the read-only Framing Product Line screen opened from the **Details** button.

New - opens empty Framing Product Line screen, so that new framing product line can be defined and saved in the database.

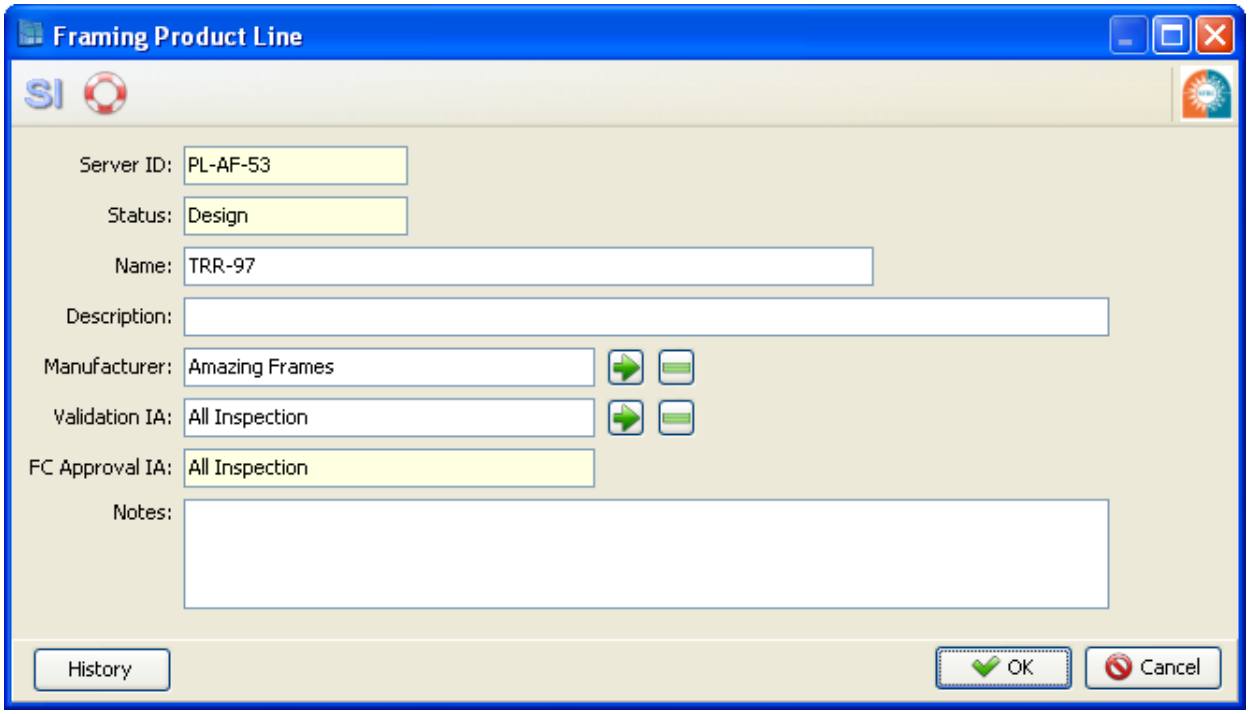
Copy - creates a copy of selected framing product line.

Delete - remove selected framing product line from the library.

3.8.1 Framing Product Line Screen

Creation of new framing product lines, as well as modification of the existing ones, is possible in the **Framing Product Line** screen, accessible by clicking the **New** button in the Framing Product Lines screen, by selecting a framing product line in the Framing Product Lines screen and clicking the **Edit** button, or double-clicking on a framing product line.

© 2010 National Fenestration Rating Council, Inc.



Framing product line name, description and notes need to be manually input in appropriate fields, while selection of manufacturer and designated validation IA is made from list screens opened by clicking on corresponding 'arrow-buttons'. When the validation IA company is selected, it is also assigned as inspection agency for review of frame components that belong to the framing product line. If necessary, selection of manufacturer and validation IA can be removed using the (–) button.

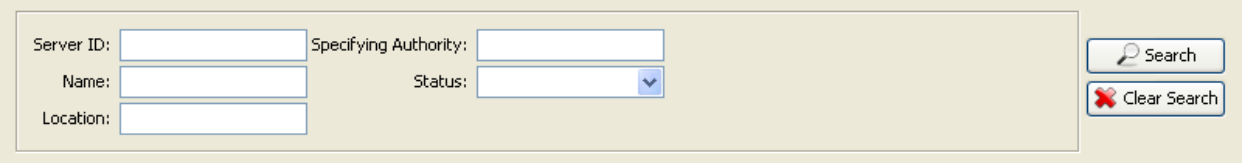
Editing is allowed only for the of the framing product lines in "Design" status, and it should be noted that change of manufacturer will be automatically referenced in server ID of the framing product line (if it is already assigned). Company code as a part of the server ID will be updated, and the same applies to all frame components that belong to the framing product line.

3.9 Projects

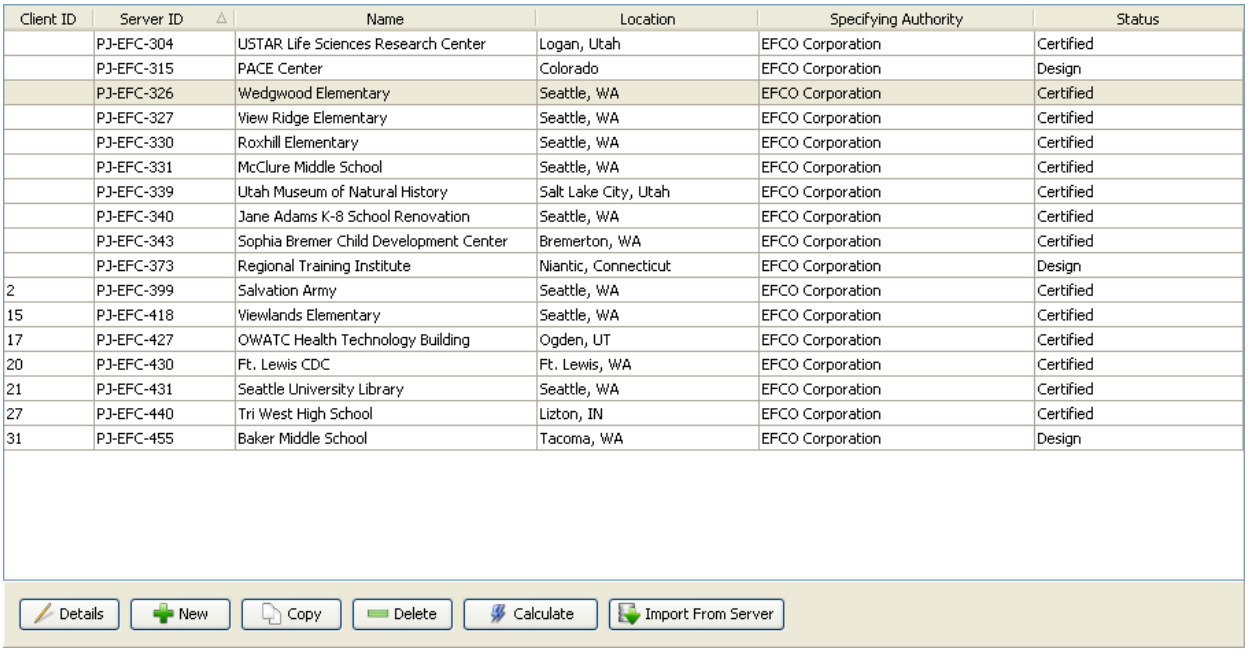
Projects, which represent sets of individual fenestration products specified for a building project, can be stored in the CMAST client database. Summarized display of the projects in the database is provided in the **Projects** screen, accessible by pressing **Projects** option in the Projects menu, or **Projects** button in the main screen toolbar.

Features in the upper part of the screen are intended for projects filtering as per specified criteria (server ID, Name, Location, etc.).

© 2010 National Fenestration Rating Council, Inc.



Tabular preview of all projects in the client database is shown in the central part of the screen, and their sorting as per certain criteria (Client ID, Server ID, Name, Location, etc.) can be done by clicking on corresponding column header.



Client ID	Server ID	Name	Location	Specifying Authority	Status
	PJ-EFC-304	USTAR Life Sciences Research Center	Logan, Utah	EFCO Corporation	Certified
	PJ-EFC-315	PACE Center	Colorado	EFCO Corporation	Design
	PJ-EFC-326	Wedgwood Elementary	Seattle, WA	EFCO Corporation	Certified
	PJ-EFC-327	View Ridge Elementary	Seattle, WA	EFCO Corporation	Certified
	PJ-EFC-330	Roxhill Elementary	Seattle, WA	EFCO Corporation	Certified
	PJ-EFC-331	McClure Middle School	Seattle, WA	EFCO Corporation	Certified
	PJ-EFC-339	Utah Museum of Natural History	Salt Lake City, Utah	EFCO Corporation	Certified
	PJ-EFC-340	Jane Adams K-8 School Renovation	Seattle, WA	EFCO Corporation	Certified
	PJ-EFC-343	Sophia Bremer Child Development Center	Bremerton, WA	EFCO Corporation	Certified
	PJ-EFC-373	Regional Training Institute	Niantic, Connecticut	EFCO Corporation	Design
2	PJ-EFC-399	Salvation Army	Seattle, WA	EFCO Corporation	Certified
15	PJ-EFC-418	Viewlands Elementary	Seattle, WA	EFCO Corporation	Certified
17	PJ-EFC-427	OWATC Health Technology Building	Ogden, UT	EFCO Corporation	Certified
20	PJ-EFC-430	Ft. Lewis CDC	Ft. Lewis, WA	EFCO Corporation	Certified
21	PJ-EFC-431	Seattle University Library	Seattle, WA	EFCO Corporation	Certified
27	PJ-EFC-440	Tri West High School	Lizton, IN	EFCO Corporation	Certified
31	PJ-EFC-455	Baker Middle School	Tacoma, WA	EFCO Corporation	Design

Finally, this screen also contains buttons for common operations with the projects:

Details/Edit - if the selected project has 'Design' status, the **Edit** button is displayed, and it opens Project screen where is possible to make modifications in the selected project; otherwise all relevant information about the project can be just reviewed in the read-only Project screen opened from the **Details** button;

New - opens empty Project screen where new project can be defined and saved in the database;

Copy - creates a copy of selected project;

Delete - remove selected project from the database. Please note that only projects in 'Certified' or 'Review' status cannot be deleted;

Calculate - performs calculation for selected project(s). It should be noted that multiple projects can be selected by holding Shift/Ctrl key and clicking on appropriate items from the list, so that after clicking the **Calculate** button calculation is performed for all of them.

Import From Server - copies projects that have been synchronized to the server for sharing with intended audience to the local client database.

© 2010 National Fenestration Rating Council, Inc.

3.9.1 Project Screen

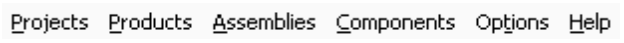
Project screen is a separate screen intended for creation of new projects, as well as for reviewing and/or editing projects stored in the CMAST client database.

In case of new projects it is opened by pressing the **New** button on the Projects screen, while for reviewing and/or editing existing projects can be used either double-clicking on selected project from Recent Projects list on the main screen, or selecting the project in the Projects screen and pressing **Edit** button (alternatively, double click on the selected project will also invoke the **Project** screen). Major areas of the **Project** screen are:

- Project Information section
- Products section

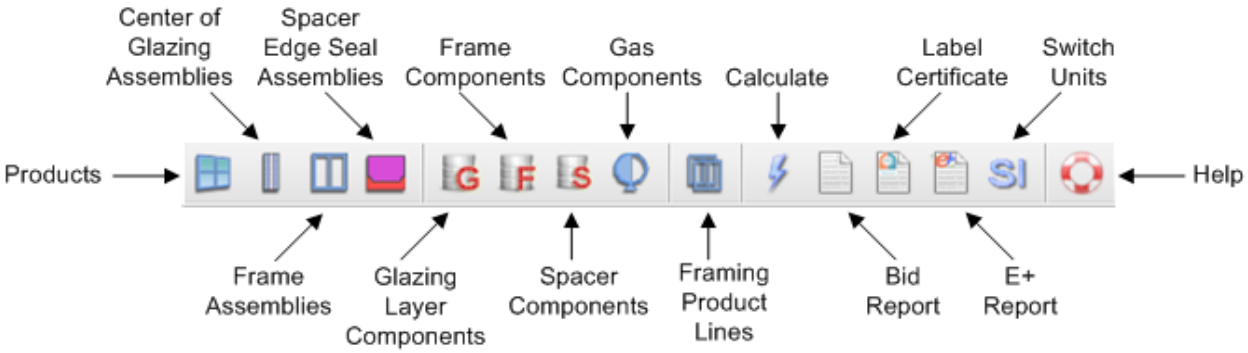
Menu bar and toolbar are placed at the top of the **Project** screen, and they provide several project-related functions.

Project screen menu bar choices correspond to the ones from the main screen menu bar, but there are some differences in their functionality.



Unlike choices on the main screen menu bar (see Products, Assemblies, Components menus), which open corresponding screens with list of all items of particular type (e.g., products; center-of-glazing, frame and spacer edge seal assemblies; glazing layer, frame, spacer and gas components) stored in the client database, options from the **Project** screen menu bar opens screens with displayed only items (e.g., products, assemblies and components) that belong to currently selected project.

Pressing corresponding buttons on the **Project** screen toolbar will also open product, assembly (center-of-glazing, frame and spacer edge seal) and component (glazing layer, frame, spacer and gas) screens containing only items included in the currently selected project.



Besides, the **Project** screen toolbar has few additional functions:

© 2010 National Fenestration Rating Council, Inc.

Calculate

This function is used for calculation of main thermal indices for products included in the project. If any of the components, or assemblies, which particular product consists of, does not contain all the necessary data required for calculation, or the component/assembly is deactivated (deleted), calculation will not be performed for that product, and appropriate message would be issued. In that case, all products for which calculation could not be done are highlighted in the Products section, and each of these highlighted products user can open either by double-click on it, or by selecting it and pressing the **Edit Product** button, in order to correct issue.

Bid Report

This option provides possibility for each registered user to obtain a Bid Report for the project. It should be noted that currently Bid Report cannot be created for projects in "Review" or "Certified" status.

Label Certificate

By pressing this button users with ACE rights will be able to submit the project for Label Certificate. Once the label certificate is issued, it can be accessed and saved in PDF format only through the CMAST web portal (for details please refer to Label Certificate section).

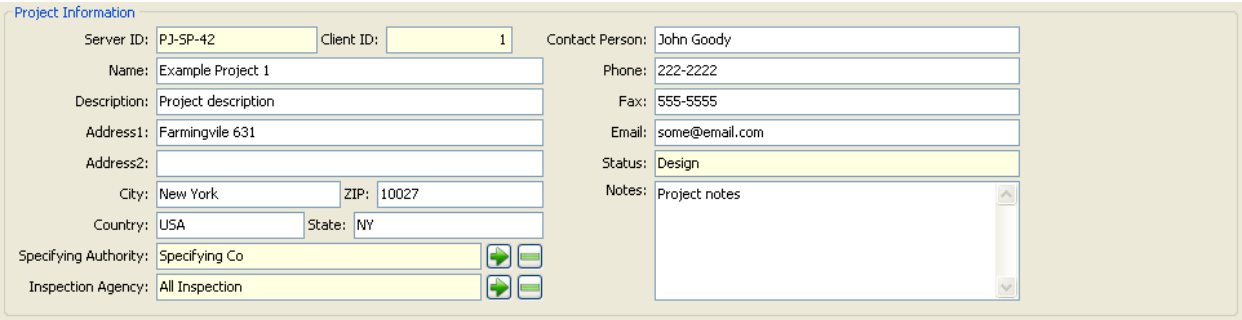
E+ Report

Pressing this function button would start creation of EnergyPlus report files for each product in the project that have valid results (i.e., whole product indices - U, SHGC and VT), and these individual EnergyPlus report files would be then combined in a single file (. txt format) for the whole project. Each product in the whole project E+ report would be recognized by its name, but for the clarity the products would be listed in the order they are displayed in the Products section. As in case of Bid Report, EnergyPlus report cannot be created for projects in "Review" or "Certified" status. Please note that in case of certified projects, EnergyPlus reports for particular products that the projects consists of can be accessed and saved as text files through the CMAST web portal only (for details please refer to Label Certificate section).

3.9.1.1 Project Information section

This part of the **Project** screen presents general information about the project - project name; description; location (e.g., Address, City, ZIP code, Country, State); Specifying Authority and Inspection Agency; as well as information about Contact person (e.g., Name, Phone and Fax Number, E-mail address).

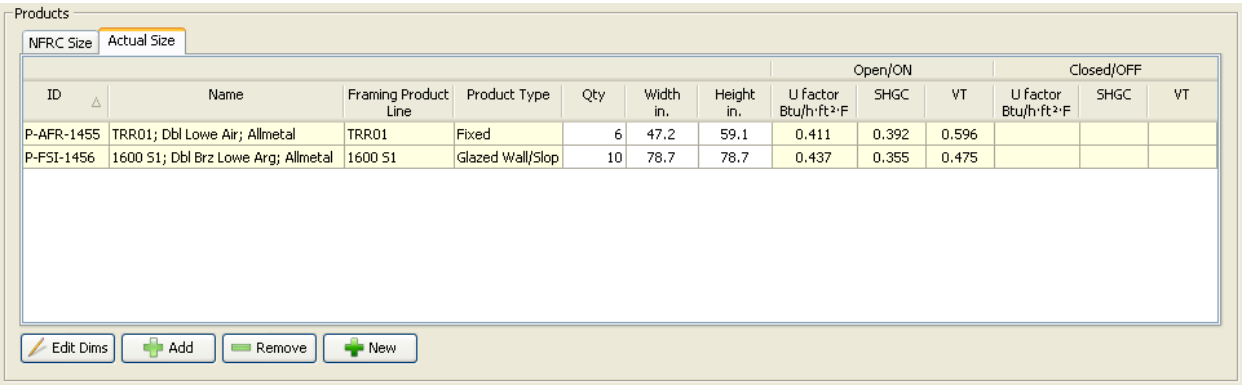
© 2010 National Fenestration Rating Council, Inc.



Client ID, Server ID and Status fields are read-only, while all other data can be defined manually, or chosen from corresponding lists opened by clicking on the 'arrow' buttons (like Specifying Authority and Inspection Agency). However, information about the Specifying Authority and Inspection Agency is mandatory only for projects for which label certificate is sought.

3.9.1.2 Products section

This section shows list of all fenestration products in the project with their type, dimensions, framing product lines they belong to, and number of each particular product included in the project. In addition, NFRC standardized and user-defined dimensions, and corresponding main thermal indices are displayed for all products using the **NFRC Size** and **Actual Size** tabs.



Sorting of the products by grid column headings is possible, and on the **Actual Size** tab users can set product quantity and dimensions in corresponding grid cells, as well as take advantage of several buttons for manipulating products in the project. Those are:

Details/Edit Dims - if status of the project is 'Design', displayed **Edit Dims** button opens Product screen in 'edit mode' where user can modify product copy included in the project by changing its dimensions; otherwise the button **Details** opens the read-only Product screen where details about the product can be reviewed, but not changed.

Add - this button is enabled only if the project status is not 'Certified' or 'Review', and it opens Products list where product can be selected for inclusion in the project;

© 2010 National Fenestration Rating Council, Inc.

Remove - this button is also disabled when the project status is 'Certified' or 'Review', otherwise it is used for deletion of selected product from the project;

New - in case of projects that are not in 'Certified' or 'Review' status this button provides access to Product screen where new product can be created from scratch and added in the project.

It should be noted that the **Add**, **Remove** and **New** buttons are disabled when the **NFRC Size** tab is opened; while the displayed **Details** button can be used just for reviewing information about selected product.

3.10 Bid Report

As already indicated, all registered users can request Bid Report for the report using the **Bid Report** button in the Project screen toolbar, and after pressing the button, CMAST client application will check whether all products in the project meet necessary criteria for obtaining Bid Report. According to these criteria, all components and assemblies, which particular product consists of, must contain all the necessary data required for calculation of whole product indices, while some information, like frame and spacer component manufacturers, needs to be also specified.

If these criteria are not satisfied, project cannot be submitted for Bid Report, and user would be informed about that with corresponding message. In addition, all products that do not meet criteria would be red-highlighted in the Products section, and user can further access each of these products in the Product screen in order to fix problems.

When the Bid Report is successfully created, it will provide handy summary of all products included in the project and assemblies (e.g., center-of-glazing, spacer and frame) that products consists of.

The **Product Listing** section at the top of the report presents tabulated information about all products in the project, including their respective names and main indices (U, SHGC and VT) determined at NFRC standardized size for each product type. Center-of-glazing, spacer and frame assemblies, applied in the listed products, are also referenced here.

PRODUCT LISTING:

					Performance at NFRC Standard Size		
ID	Name	Framing Ref	Glazing Ref	Spacer Ref	U	SHGC	VT
					Btu/ hr•ft²•°F	-	-
P-PL-010	PL-2200 / PL-2210	FA-PL2210	GA-TT-001	SA-AM-001	0.53	0.58	0.66
P-PL-005	PL-3400 / PL-3401	FA-PL3401	GA-TT-001	SA-AM-002	0.56	0.57	0.65
P-PL-012	PL-5700 / PL-5720	FA-PL5720	GA-TO-002	SA-AM-001	0.52	0.21	0.30
P-PL-002	PL-1100 / PL-1152	FA-PL1152	GA-TT-001	SA-AM-001	0.42	0.51	0.62
P-PL-022	PL-9900 / PL-9915	FA-PL9915	GA-TO-003	SA-AM-002	0.45	0.15	0.19

Listing of all center-of-glazing, spacer and frame assemblies that are applied in the

© 2010 National Fenestration Rating Council, Inc.

products is displayed below. In addition to assembly names, short description of each assembly is also provided.

FRAME, GLAZING and SPACER ASSEMBLIES:

GLAZING LISTING:

GLAZING REF	SUPPLIER ID	DESCRIPTION
GA-TT-001		1" Double Glazed, 1/4" HC Low-e, 1/4" Clear, Argon (90%), 1/2" gap
GA-TT-002		1" Triple Glazed, 1/8"Clear, Coated film, 1/8"SC, Argon (90%), 3/8" gap
GA-TT-003		1" Double Glazed, 1/4" Bronze, 1/4" SC Low-e, Argon (90%), 1/2" gap

SPACER LISTING:

SPACER REF	SUPPLIER ID	DESCRIPTION
SA-AM-001		250P Mill Finish Aluminum Low profile (1/2")
SA-AM-002		15A Polymer Spacer (3/8")

FRAMING LISTING:

FRAMING REF	SUPPLIER ID	DESCRIPTION
FA-PL2210		Single Casement Thermally Broken Aluminum
FA-PL3401		Projecting (Awning) Thermally Broken Aluminum
FA-PL5720		Vertical Slider PVC reinforced with Steel
FA-PL1152		Vertical Slider Thermally Broken Aluminum
FA-PL9915		Fixed Thermally Broken Aluminum

Finally, products performance at actual (user defined) size, intended for use in area-weighted average calculations and energy simulation programs, is displayed in the last part of the report. Beside product names and their main indices, quantity, dimensions and total area that each product is covering, are presented in the table.

PRODUCT LISTING:

					Fenestration Performance at Actual Size*				
ID	Qty	Total Area	Name	EnergyPlus Report File	Width	Height	U-factor	SHGC	VT
		ft²	ft²		in.	in.	Btu/hr•ft²•°F	-	-
P-PL-010	2	48.00	PL-2200 / PL-2210	www.nfrc.org/CMAST/pl2200-2210.txt	48.00	72.00	0.48	0.59	0.66
P-PL-010	5	88.89	PL-2200 / PL-2210	www.nfrc.org/CMAST/pl2200-2210.txt	40.00	64.00	0.50	0.56	0.64
P-PL-005	6	192.67	PL-3400 / PL-3401	www.nfrc.org/CMAST/pl3400-3401.txt	68.00	68.00	0.49	0.58	0.65
P-PL-005	3	54.00	PL-3400 / PL-3401	www.nfrc.org/CMAST/pl3400-3401.txt	72.00	36.00	0.51	0.55	0.62
P-PL-005	5	167.22	PL-3400 / PL-3401	www.nfrc.org/CMAST/pl3400-3401.txt	86.00	56.00	0.48	0.59	0.67
P-PL-012	10	382.22	PL-5700 / PL-5720	www.nfrc.org/CMAST/pl5700-5720.txt	64.00	86.00	0.33	0.22	0.30
P-PL-002	3	60.00	PL-1100 / PL-1152	www.nfrc.org/CMAST/pl1100-1152.txt	48.00	60.00	0.52	0.53	0.60
P-PL-022†	21	525.00	PL-9900 / PL-9915	N/A	N/A	N/A	N/A	N/A	N/A

© 2010 National Fenestration Rating Council, Inc.

3.11 Label Certificate

Upon pressing the **Label Certificate** button in the Project screen toolbar, CMAST client application will perform checking if all criteria for obtaining label certificate are satisfied. Those criteria include:

- Each product in the project must have valid results (i.e., whole product indices - U, SHGC and VT);
- All components (e.g., glazing layer, frame and spacer) must be approved, and all assemblies and products must be made of these approved components;
- All required information about the project (including Specifying Authority and Inspection Agency) must be defined.

If any of these criterions is not satisfied, label certificate for the project can not be requested, and corresponding message would be displayed to inform user about that.

Also, all products that do not meet certification criteria would be highlighted in the **Products** section, and each highlighted product can be opened in the Product screen either by double-click on it, or by selecting it and pressing the **Edit Dims** button, in order to review the problems. Please note that assemblies and components applied in particular product can be accessed from the Product screen just for review, and not for any change.

When the project is successfully submitted for Label Certificate, it gets status 'Review' and becomes locked for further editing. The same applies to all products, assemblies and components that it includes, so all changes, if required, needs to be made in copies of

© 2010 National Fenestration Rating Council, Inc.

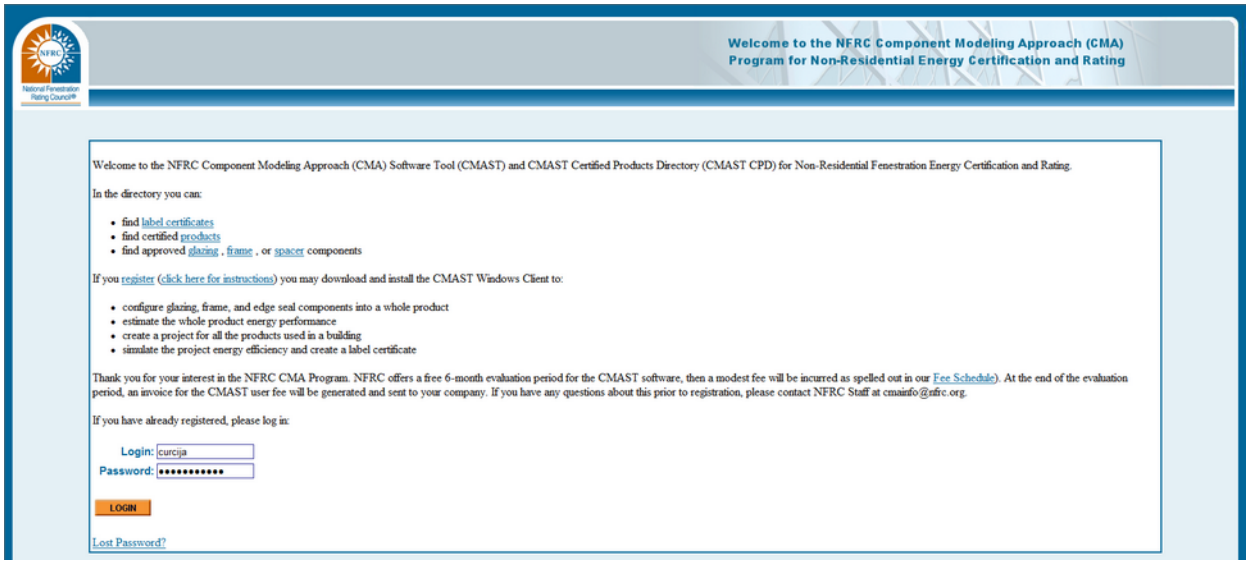
these products, assemblies and components.

© 2010 National Fenestration Rating Council, Inc.

4. Web Portal

4.1 Login Page

The CMAST server application login page is designed to provide public access search of Certified Products Database (CPD), but there are also options for performing some basic administrative functions for first time users (e.g., User Registration) and existing users (e. g., Login; Lost Password retrieving).



Links in the top left part of the page are intended for public access to the Certified Products Database, and each of them leads to particular section of the database:

- **Label Certificates** - opens Find Label Certificate page where an individual can search for a particular label certificate(s).
- **Products** - opens Find Product page with options for browsing NFRC certified products (i.e., products that are part of an issued CMA label certificate).
- **Glazing** - opens Find Glazing Component page that provides an individual access to a list of NFRC-approved glazing layers.
- **Frame** - opens Find Frame Component page where an individual can search for NFRC-approved frame components.
- **Spacer** - opens Find Spacer Component page where an individual can search for NFRC-approved spacer components.

Clicking on the **Register** link pull up User Registration page which is required to be completed and submitted for verification by NFRC. On the user registration page a perspective user can access Company Registration page in order to register his or her

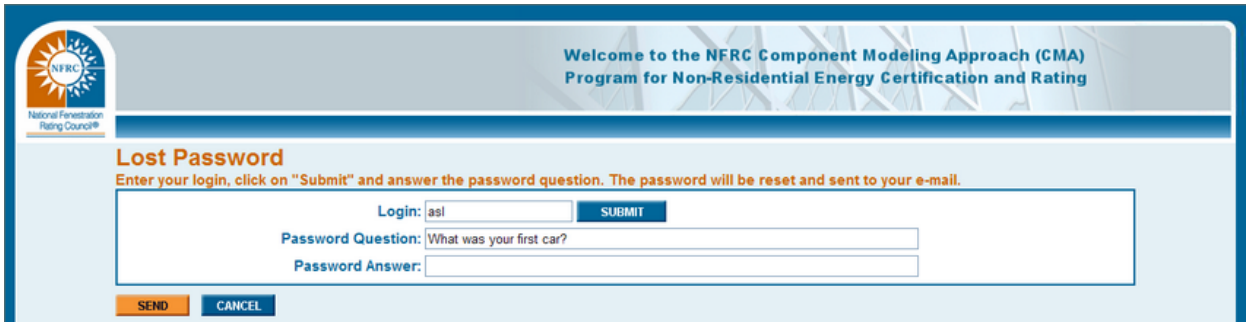
© 2010 National Fenestration Rating Council, Inc.

company information with NFRC.

Existing users can access the server application by typing their login name and password into corresponding fields and pressing the **Login** button, while the **Lost Password** link starts the Lost Password page which allows a user to obtain a new login password if the old one is lost or forgotten.

4.2 Login Troubleshooting

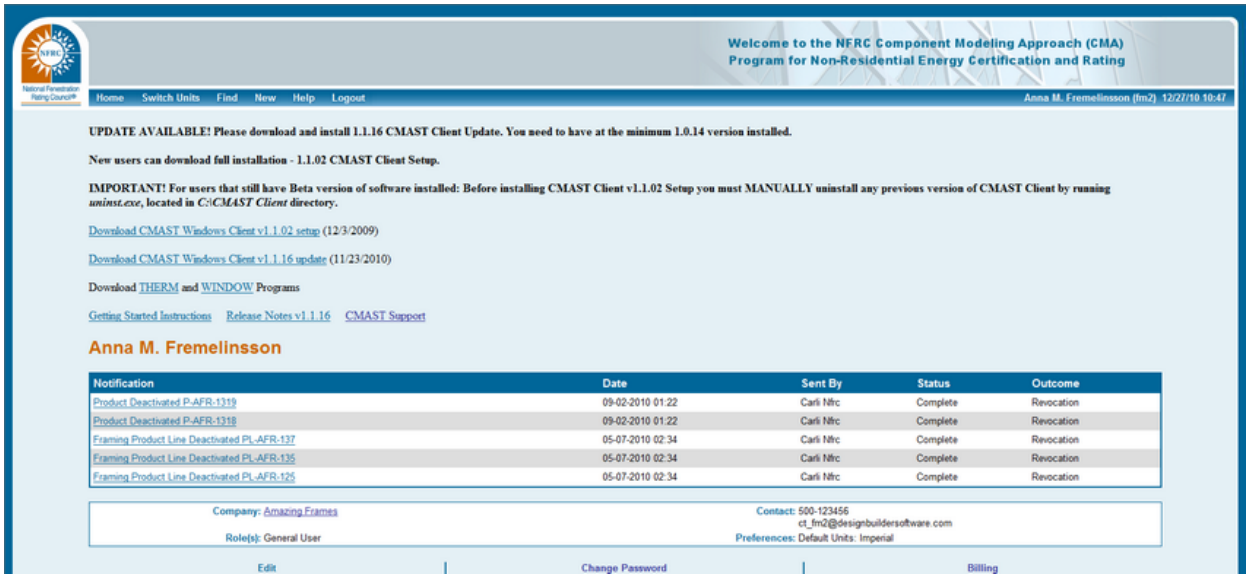
If password for login is lost or forgotten, a new one can be obtained using the **Lost Password** link on the server Start Page. Clicking on it leads to the following page where Login name needs to be entered. After pressing the **Submit** button, fields for Password Question and Password Answer, defined during registration, are displayed. The Password Question is automatically input, while the Password Answer needs to be typed-in manually. If the Password Answer is filled-in correctly, the process will be finished successfully after pressing the **Send** button and new password sent via e-mail.



4.3 Home Page

The Home page is displayed after a registered user logs in to the CMAST server application. Options for performing certain tasks and accessing particular database sections are provided there, and they vary for different users based on their roles and associated permissions.

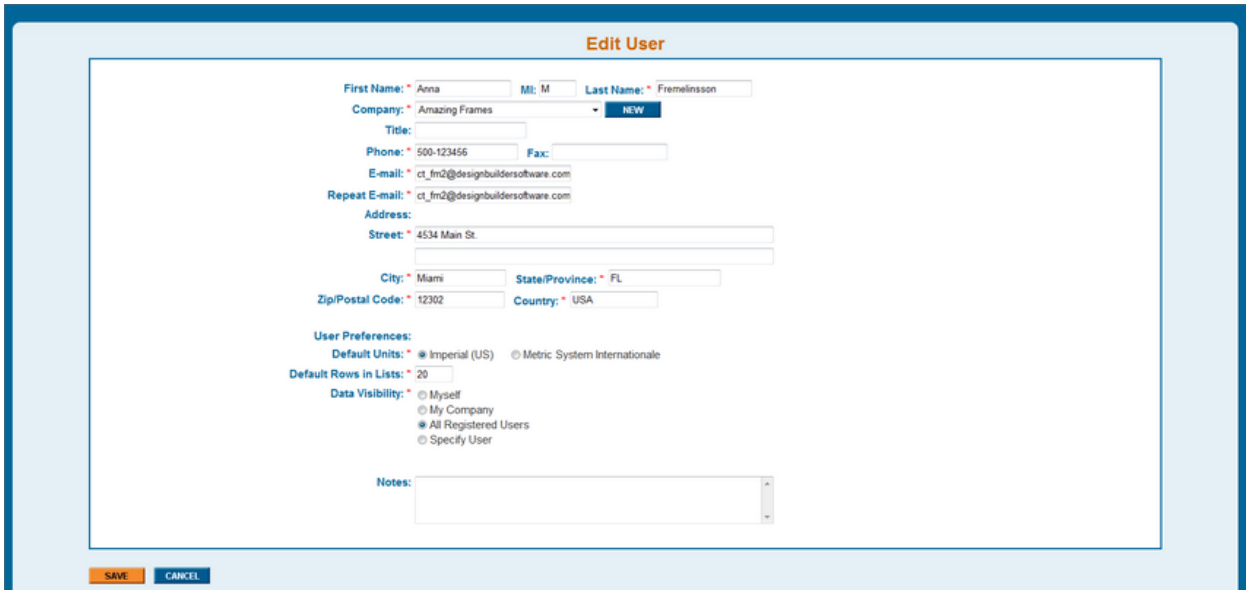
© 2010 National Fenestration Rating Council, Inc.



Main menu is placed at the top of the page, and offered choices depend on the user's role and associated permissions. Corresponding links below the main menu allow for downloading the latest versions of the CMAST client, THERM and WINDOW applications, as well as basic instructions for starting the client application. User name and related information, which includes Company, Role(s), Contact - phone/fax number and e-mail, and Preferences - default units system, are displayed in the central part of the screen. List of all notifications for particular user (if there are any) is also displayed there.

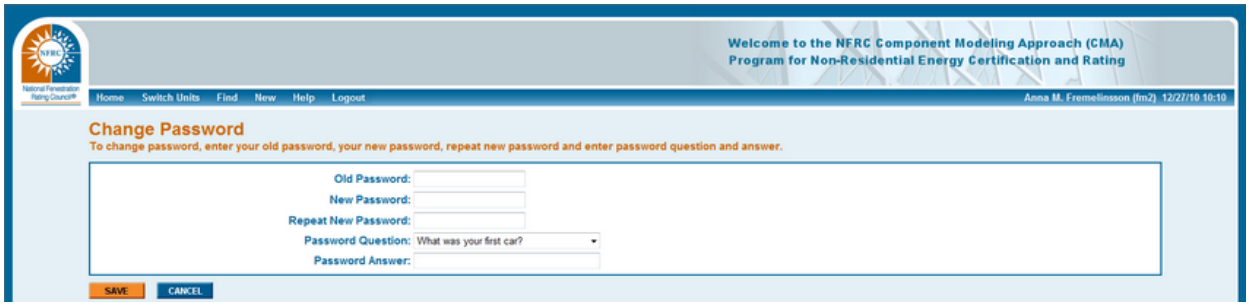
Access to user-specific options (e.g., the ones based on their roles and corresponding permissions) is provided through links below the user details. These links are the following:

Edit - opens Edit User page where essential user information, defined during registration, can be changed as necessary.

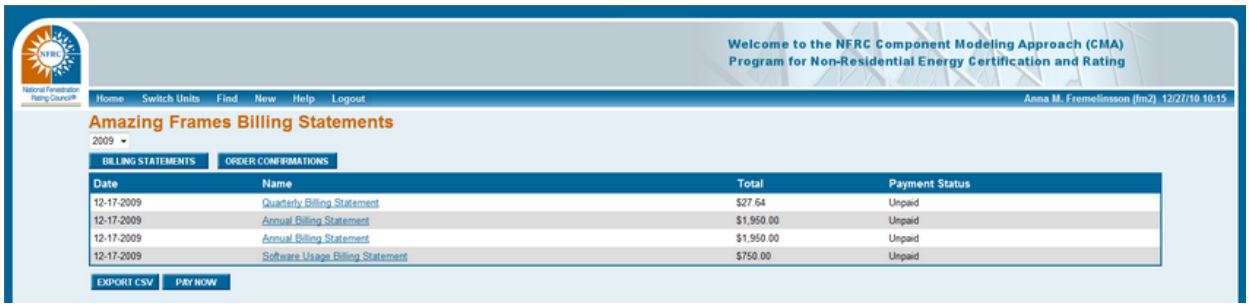


© 2010 National Fenestration Rating Council, Inc.

Change Password - opens Change Password page where user can set-up new password for login.



Billing - this link is provided only if the user is defined as company's Billing Contact, and it opens **Billing Statements** page where current calendar year statements for the company are listed by default.

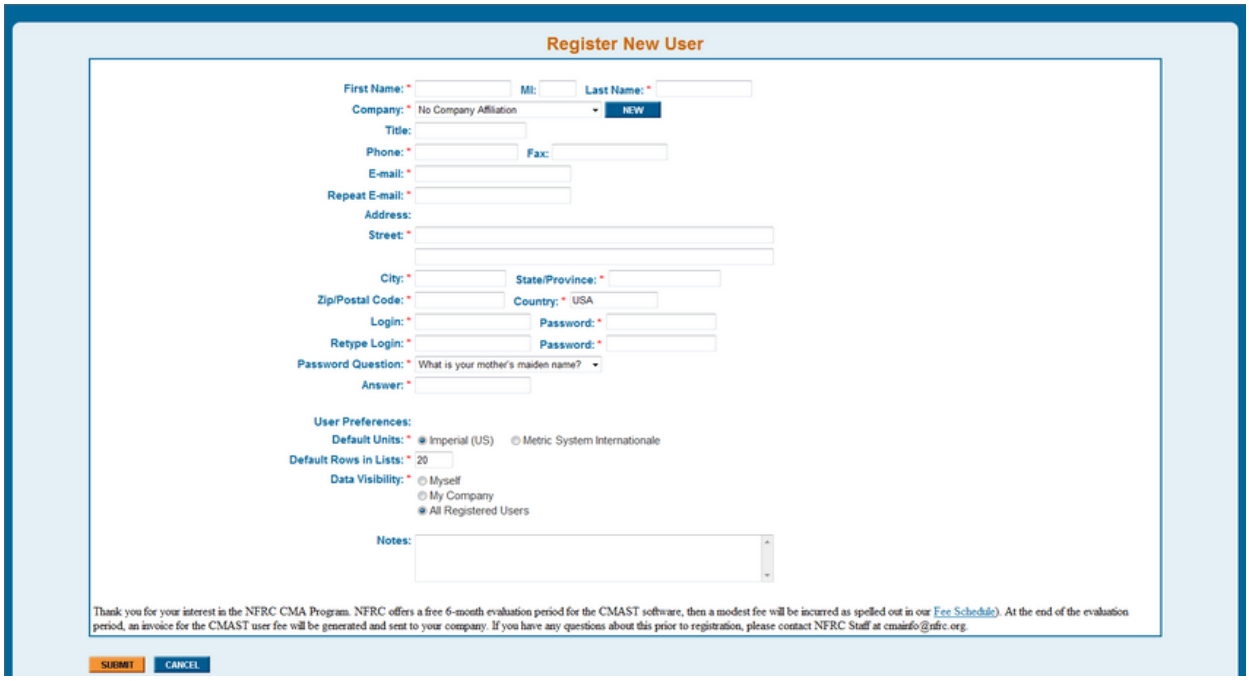


4.4 Users

4.4.1 User Registration

The User Registration web page will be displayed after pressing the **Register** link on the on the server Login Page, and it provides fields for entering all necessary information about new user. Most fields are required to be completed, and they are marked with an asterisk (*). Optional data (i.e., not required for the registration) include user's Mid Initial, Title, Fax number and Notes.

© 2010 National Fenestration Rating Council, Inc.



During registration, user can set the visibility to “Myself ”, “My Company”, or “All Registered Users”. Depending on the selected visibility, user's detailed information will be shown, or hidden for unauthorized users. Note that "Myself" visibility means that user is still displayed in list view screens, and that only details are not available. Also, if user is not associated with a company, it can choose “No company affiliation” in the **Company** drop-down list.

Once all the necessary data are input, the registration is reported as “successful” upon pressing the **Submit** button. At the same time, the user (and user's company) data are sent for verification to NFRC, while a notification about the registration is also generated for the NFRC. When the registration is verified and any required payments received and processed, NFRC approves the user by accessing the the Person Detail page (which can be done either directly by clicking on the notification, or using the Find/Person option and searching for the new user) and clicking the **Approve** button. Upon approval, the user will be informed via e-mail and will receive a login username and password for the server application. In case of user verification rejection, status is changed to “Suspension” and user is informed about that. User can e-mail NFRC, requesting approval. If approval is accepted, NFRC staff user can navigate to person details screen, where it can approve user and/or edit its information, including roles.

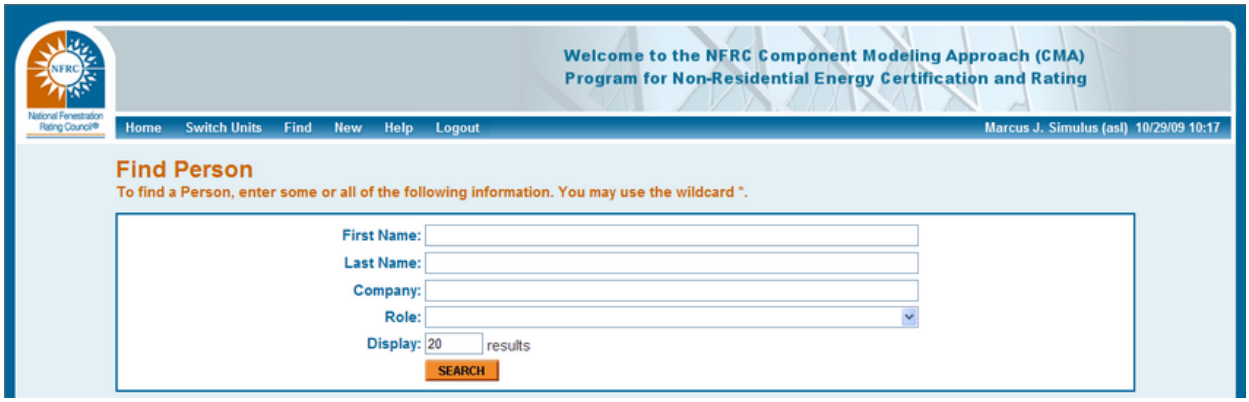
4.4.2 User Details

List of registered CMAST users is accessible by all users, and each user has ability to change just his/her own preferences. In addition, the NFRC users only have possibility to manage user accounts (e.g., activate/deactivate them) and edit preferences and roles for all users.

Clicking on the **Person** option from the Find menu opens the Find Person page, which

© 2010 National Fenestration Rating Council, Inc.

provides options for searching users according to several criteria - First Name; Last Name; Company and Role, and there is also possible to specify number of displayed search results per one page.

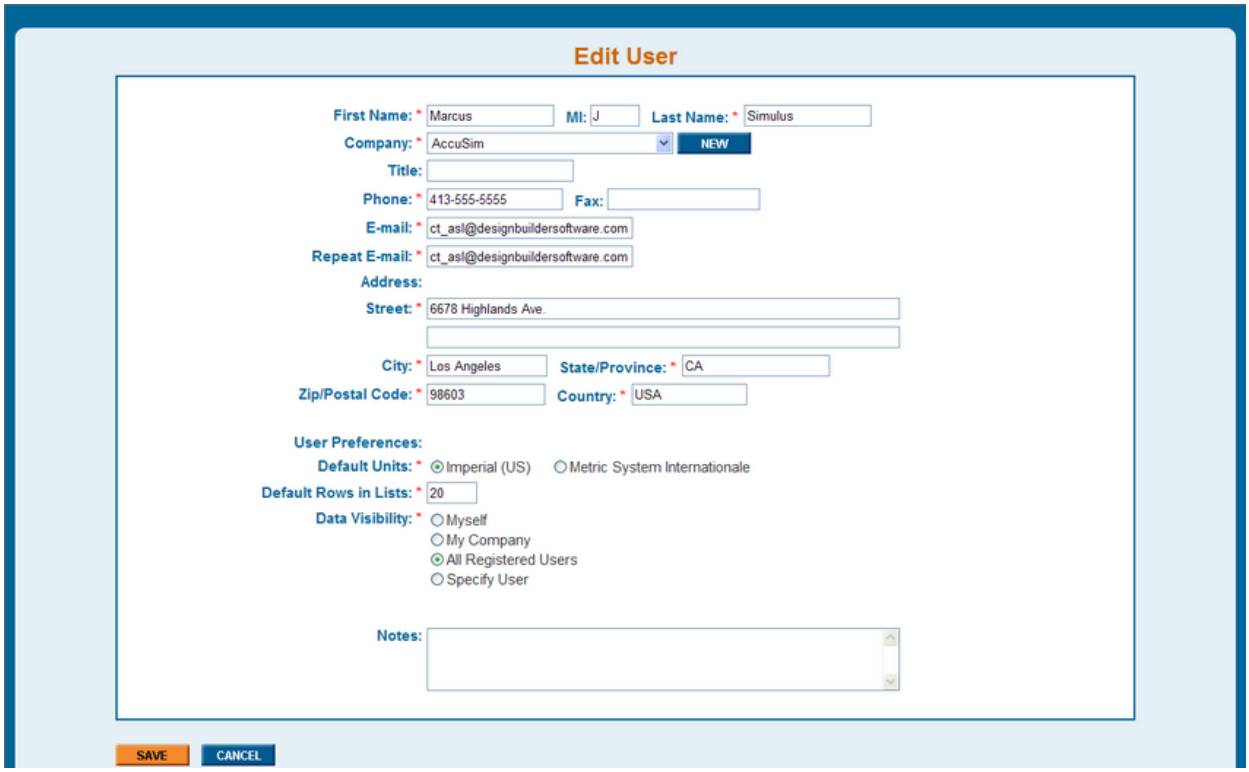


After pressing the **Search** button, resulting list of users will be displayed in the following page. As in case of other "list view" pages, number of displayed records can be changed, as necessary, in corresponding box at the bottom of the page. At the same time, the **Next/ Previous** links will be shown in the last row if the total number of records that meet specified criteria is higher than the number of displayed records per one page.

Clicking on particular user name will lead to the Person Detail page where summary of information about the user is displayed. This information is always available for the NFRC users, while the other users can review it only if **Data Visibility** of this particular user is not 'Myself'. Those data include user's company, role, contact information (e-mail, phone/fax number) and status.

© 2010 National Fenestration Rating Council, Inc.

As already indicated, each user has ability to change its own preferences on corresponding page accessible using either the **Edit** link in user's Home page, or the **Edit User** button. These data include user's personal details, company information, address, default units system and data visibility. Please also note that there are certain data that only NFRC can edit, such as user roles, and review percentages.



Company change is possible by selecting another company from corresponding pull-down list. In that case, a new account for the user is created and associated with selected company, while all other information remains the same. Status of the account is set to “Pending”, and corresponding notification is sent to NFRC to perform verification. User can not log back in to CMAST until NFRC completes verification of the company change. At the same time, user's account with former company affiliation is deactivated, and all existing components/certificates/notifications for this user refer to the deactivated account. Once user is approved, all subsequent submittals and notifications will refer to the new

© 2010 National Fenestration Rating Council, Inc.

account.

Person that represents company's primary contact cannot change company affiliation until new company representative has been assigned to the company. Therefore, either current company representative, or NFRC needs to select new company representative on the Edit Company page, and only then the company representative can change company. The same applies to company's billing contact - the company representative or NFRC must assign a new billing contact to the company before the billing contact could change company affiliation.

4.4.3 User Roles

All newly registered users get General User role, and if a user wants to change its role, that can request from NFRC Staff. This request is done outside of CMAST (offline), and it is also possible to request additional multiple roles. Based on successful completion of requirements for certain roles (e.g., training and exam passed for ACE), NFRC will independently update role without further user request.

The following user roles are available in CMAST application:

- **General User** - this is the role with the least privileges. It allows user to login, download CMAST Client and use both client and web, but without the ability to either submit components or label certificates for review.
- **Inspection Agent in Responsible Charge (IARC)** - this is the role that in addition to privileges of general user allows user to review, approve or reject submittals from SIRC, TIRC, and ACE.
- **Simulator in Responsible Charge (SIRC)** - this is the role that in addition to privileges of general user allows user to submit components for review.
- **Tester in Responsible Charge (TIRC)** - this is the role that in addition to privileges of general user allows user to enter Validation Test Data.
- **Approved Calculation Entity (ACE)** - this is the role that in addition to privileges of general user allows user to submit label certificates for review.
- **NFRC Staff** - this is the role with broad range of privileges encompassing privileges of IARC, SIRC, TIRC, and ACE, and provides some additional privileges, such as ability to see deactivated records, components under Review status, change user roles, edit user information, change statuses of components and label certificates.
- **NFRC Administrator** - this is also the role with broad range of privileges and its primary purpose is to set various CMAST administrative options, such as configuring top level program options, reporting, etc.

© 2010 National Fenestration Rating Council, Inc.

- **NFRC Accounting** - this is the role that allows user to process and monitor payments and financial transactions by companies and users.

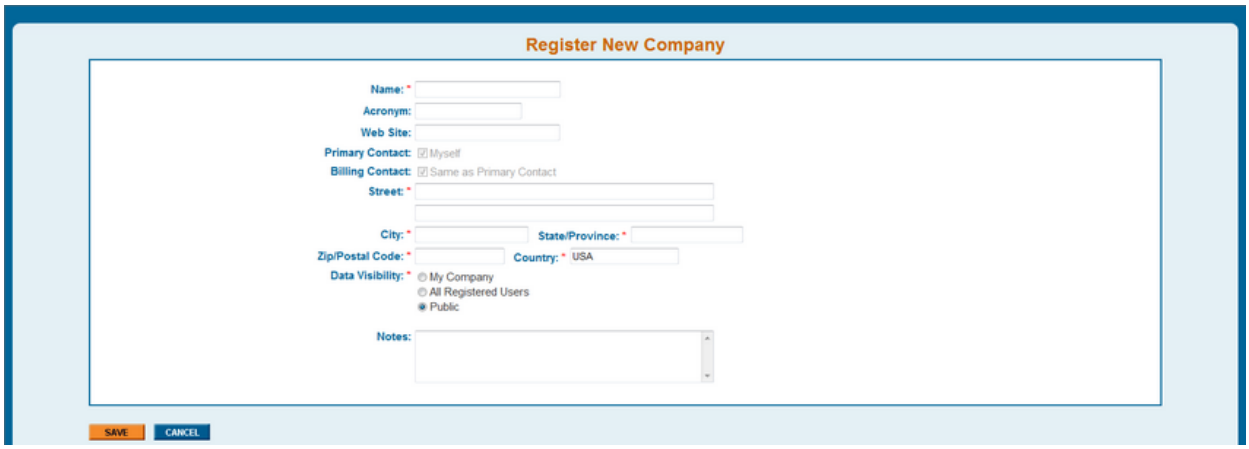
Users can have multiple roles, subject to some limitations:

- IARC cannot be ACE;
- SIRC can also be TIRC;
- SIRC and/or TIRC can also be ACE;
- NFRC roles can be combined.

4.5 Companies

4.5.1 Company Registration

In addition to user registration, a new company can be also registered. Pressing the **New** button next to the **Company** combo-box on the User Registration web page will open corresponding web page. Additionally, the Company Registration web page can be opened using the **Company** option from the New menu. Most of the fields, marked as required, need to be filled-in manually except **Data Visibility** where one of the three visibility options should be selected.



During registration, company visibility can be selected to “My Company”, “All Registered Users” or “Public”, and based on selected choice company details will be shown/hidden in detail screens for intended audience.

Company representative (i.e., primary contact) and billing contact is mandatory information, so user who first registers company becomes (by default) the company representative and billing contact. This can be changed later on by the company representative, which is authorized representative for the company in contractual matters

© 2010 National Fenestration Rating Council, Inc.

with NFRC.

After entering all required data, the **Save** button needs to be pressed in order to complete company registration process. Status of the company registration is now set to "Pending", and needs to be verified and approved by NFRC. As in case of user registration, upon the company registration is verified and all payments processed NFRC staff user will login the CMAST server application and approve the company registration in the Company Details page. If NFRC rejects company registration, a notification is sent to company representative, who needs to further communicate with the NFRC offline, so NFRC will eventually approve the company.

Once the company is approved by NFRC, its role is set to Other. In order to change the role, the company representative can make a request to NFRC. This request is done outside of CMAST (offline), and it is also possible to request additional multiple roles. If the company satisfies requirements for certain role(s), NFRC will independently update role without further request from the company representative.

The following company roles are available in CMAST:

- Frame Manufacturer;
- Spacer Manufacturer;
- Glazing Manufacturer;
- Accredited Simulation Laboratory (ASL);
- Accredited Testing Laboratory (ATL);
- Inspection Agency;
- Approved Calculation Entity (ACE) Organization;
- Other.

Some companies may have multiple roles, as per following restrictions:

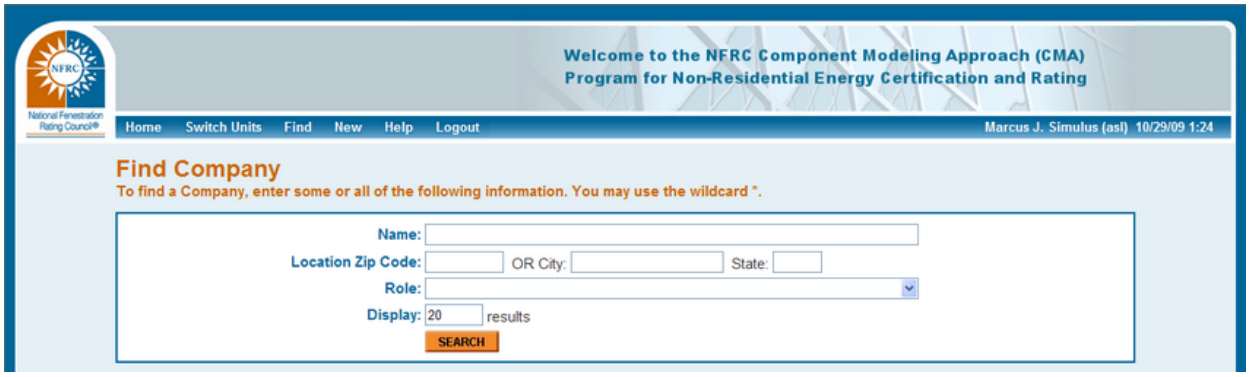
- ASL and ATL can be a single company;
- ASL and/or ATL can also be ACE;
- Framing, spacer and glazing manufacturers can all be single company;
- Manufacturer(s) can be ACE;
- Other is designated for companies that have no other roles. If a company has at least one of the roles, Other is not applicable.

© 2010 National Fenestration Rating Council, Inc.

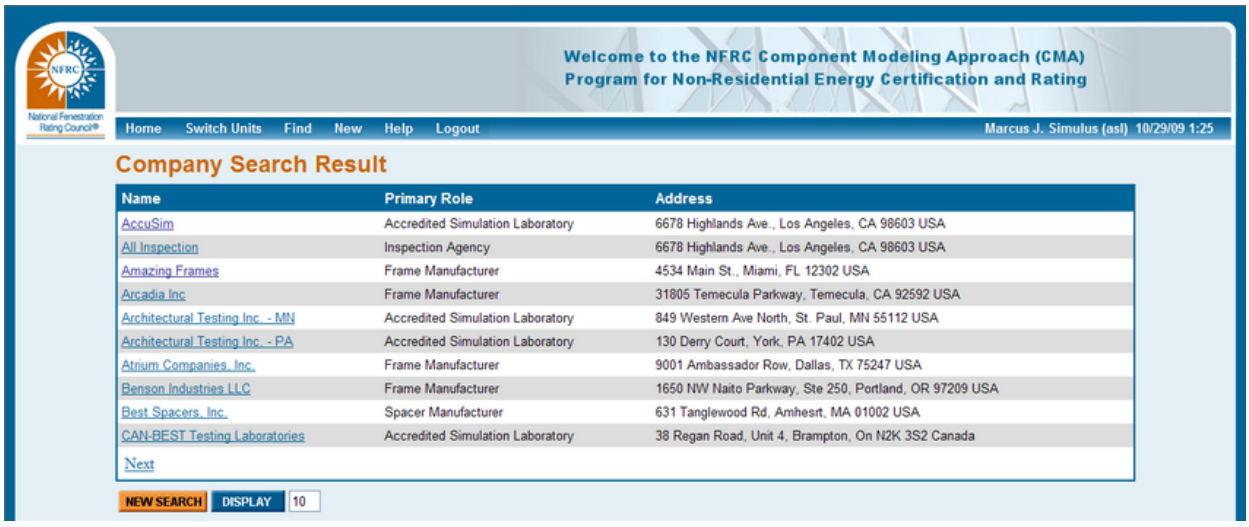
4.5.2 Company Details

List of registered companies is also available in the CMAST server application for all users, but just user defined as the company's representative (primary contact), as well as NFRC users have possibility to change company preferences and assigned roles. In addition, NFRC users can manage companies in the server database (e.g., activate/ deactivate them).

The Find Company page is accessible using the **Company** option from the Find menu, and there is possible to search for companies in the server database according to Name; Location (Zip code, or City and State) and Role. Number of displayed search results per one page can be also modified in appropriate field.



List of all companies that meet specified criteria is displayed in the Company Search Result page, and presented data include company name, its primary role, address and status.

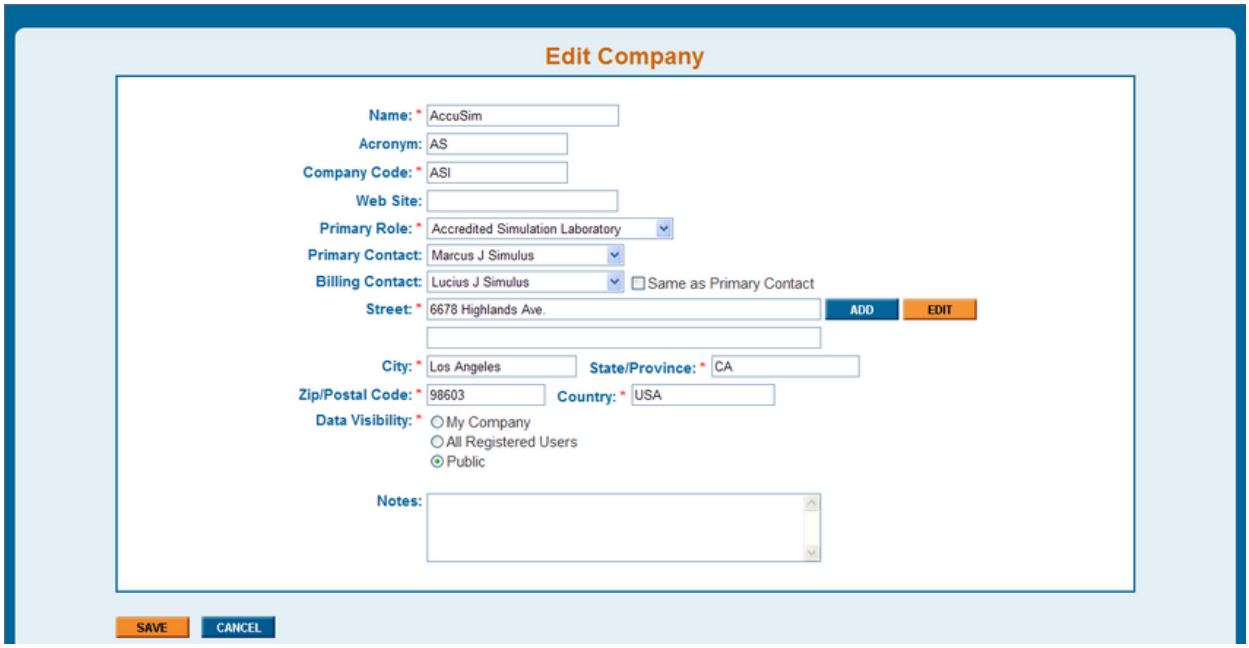


More details about particular company is available in separate page that is opened by clicking on the company name. This information is always available for the NFRC users, while the other users can review it only if Data Visibility of this particular company is not 'My

© 2010 National Fenestration Rating Council, Inc.

Company'.

Company's primary contact (i.e., company representative) can edit company details, such as name, acronym, code, web site, address, data visibility in corresponding page opened by pressing the **Edit** button. Company representative can also select another person for the company representative and billing contact. In that case, corresponding notifications are sent to the new company representative and billing contact, which assume these privileges upon next login. NFRC staff can also change company representative and billing contact.



4.6 Menu System

Upon log-in to CMAST server application, main menu will be shown at the top of each page, and offered choices depend on the user's role and associated permissions (i.e., certain menus and functions are available just for particular users).

© 2010 National Fenestration Rating Council, Inc.

4.6.1 Menu Home

The Home menu does not contain any sub-function, and by clicking on it user is automatically returned to the server application Home page.

4.6.2 Menu Switch Units

As in case of menu Home, the Switch Units menu does not contain any sub-option, and it is intended for toggling between SI and IP units.

4.6.3 Menu Find

The Find menu can be used for accessing component (frame, spacer and glazing) libraries in the CMAST server application, searching for NFRC certified product(s), label certificate(s) and validation test reports, and also for reviewing information about registered users and companies.

The menu options are:

Label Certificate

This option is intended for accessing the Find Label Certificate page and searching for particular label certificate(s).

Product

This option is for accessing the Find Product page and searching for a particular NFRC certified product(s).

© 2010 National Fenestration Rating Council, Inc.

Glazing Component

This option opens the Find Glazing Component page to view NFRC-approved glazing layers stored in the CMAST server database.

Frame Component

This option is for accessing the Find Frame Component page and searching through frame components in the database.

Spacer Component

This option is for accessing the Find Spacer Component page and searching through the spacer component library in the database.

Person

This option opens the Find Person page to search for particular CMAST user(s) and display their corresponding information.

Notification

After selecting this option, user starts the **Find Notifications** page to search for notifications that are related to his/her role.

Company

This option allows the user to access the Find Company page and search for a particular company, registered in CMAST and display their corresponding information.

Framing Product Line

This option allows the user to access the Find Framing Product Line page and search through the framing product lines in the database.

Validation Test Data

This option, available for IA, ATL and NFRC users, allow access to the Find Validation Test Result page and search for validation test report(s) for baseline product(s) in framing product line(s).

Validation Simulation Data

This option, available for IA, ATL and NFRC users, allow access to the **Find Validation Simulation Data** page and search for baseline products that are submitted for the Framing Product Lines validation.

Billing Statements

This option is available only for users that have NFRC Accountant role, and well as the ones representing Billing Contact for particular company, and it opens the **Find Billing Statements** page to search for billing statements. The NFRC Accountant users can search through billing statements from all companies, and the company's Billing Contact only through billing statements from that particular company.

© 2010 National Fenestration Rating Council, Inc.

Order Confirmations

This option is also available only for NFRC Accountant users and the companies Billing Contacts. It opens the **Find Order Confirmations** page where the NFRC Accountant users can search through order confirmations from all companies, and the company's Billing Contact only through order confirmations from that particular company.

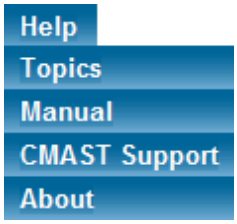
4.6.4 Menu New

This menu has option that allows each user to submit new company for registration through the Register New Company web page. In addition, there is an option provided only for the ATL (Accredited Testing Laboratory) users.

The ATL can use the **Validation Test Report** option to create new validation test report for the baseline product that is submitted for validation.

4.6.5 Menu Help

The Help menu can be used for accessing help topics and tutorials, but also for displaying information about program author.



The menu options are:

Topics

This option provides access to the CMAST on-line web help .

Manual

This option opens the CMAST user's manual in PDF format.

CMAST Support

This option is intended to access to CMAST support suite web site.

About

This option opens the page with information about program version.

© 2010 National Fenestration Rating Council, Inc.

4.6.6 Menu Logout

The Logout menu also does not have sub-options, and it provides possibility for user to exit the CMAST server application and return to the Login page.

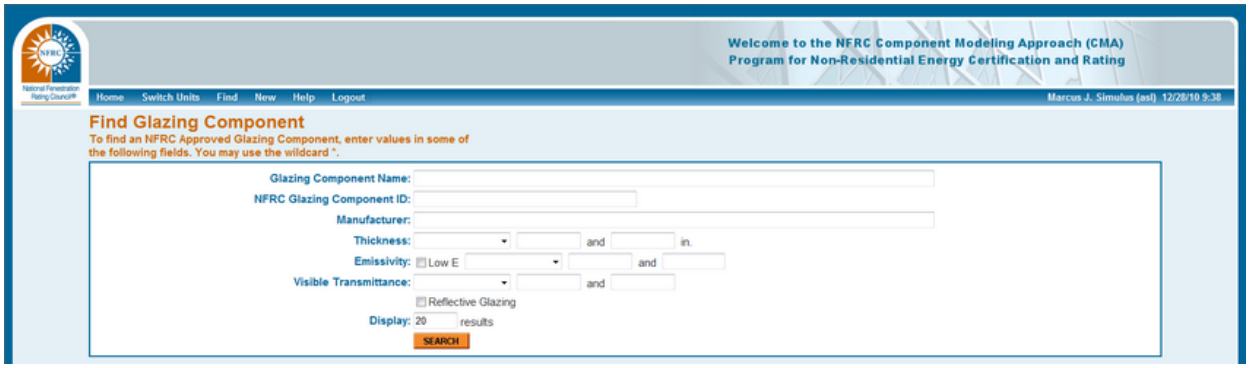
4.7 Component Libraries

4.7.1 Glazing Component

Glazing layer components, stored in the CMAST server database, include approved glasses that are retrieved from IGDB, as well as laminates and glazings with applied film, created in OPTICS, and later imported in the CMAST client database and uploaded to the server via synchronization.

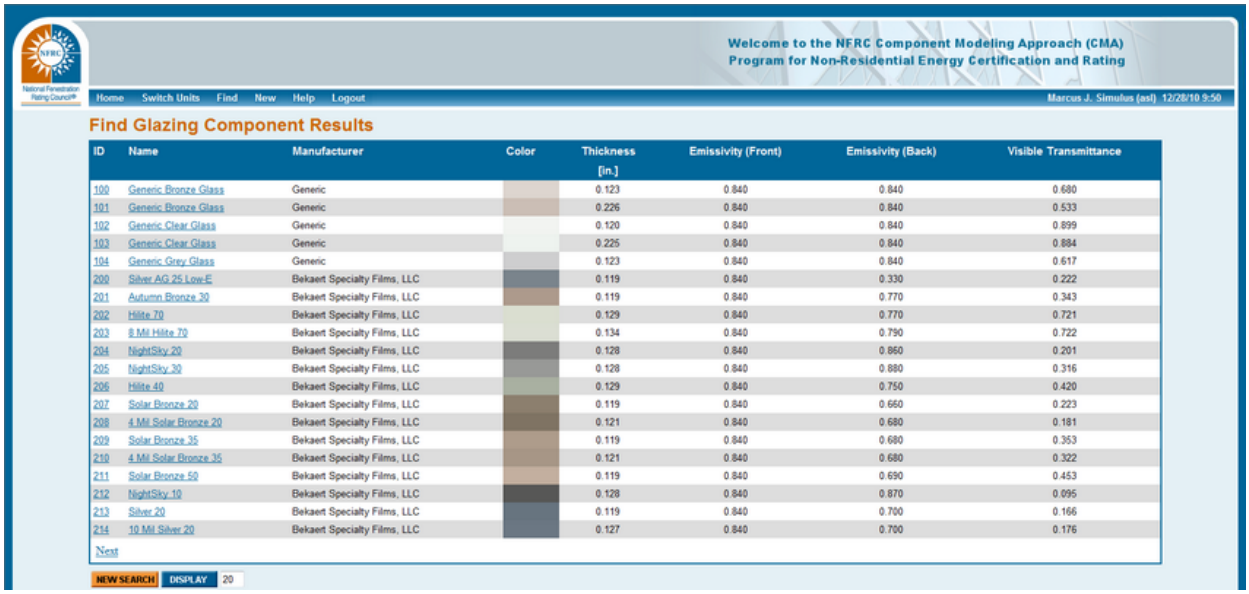
Approved glasses from IGDB are available to all registered CMAST users, as well as for the public access from the CMAST server Login Page. Regarding availability of the laminates and glazings with applied film, once being approved these glasses become equal to approved glasses from IGDB - i.e., all registered CMAST users can access them, and they are also available for public access from the Login Page.

The **Glazing Component** option from the Find menu starts corresponding page where search through glazing components in the database can be performed according to several criteria. These are: glazing component name, component NFRC ID, manufacturer name and component properties - thickness, emissivity, visible transmittance, etc.

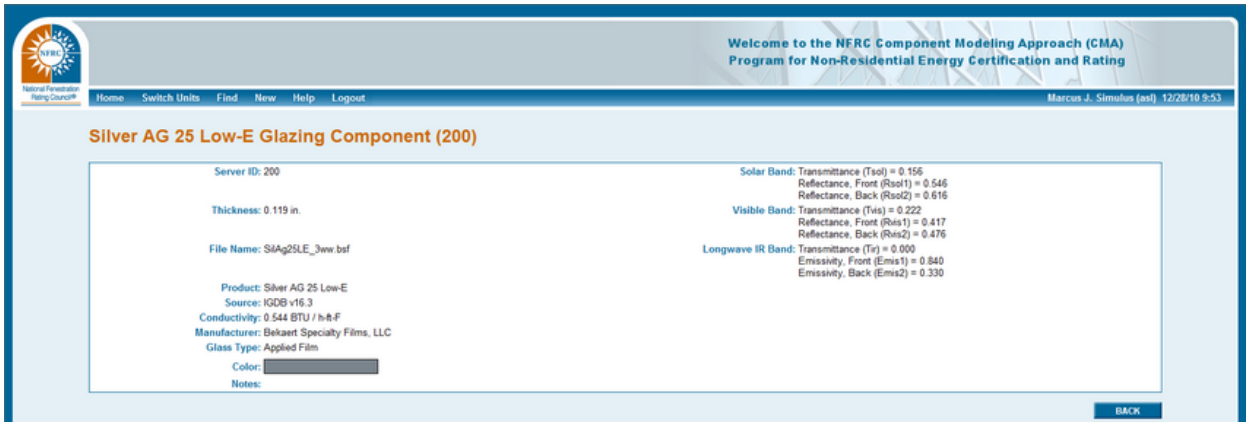


After the criteria are specified and the **Search** button pressed, corresponding list of glazing components is displayed in the following page, and it contains summarized information about each record (e.g., manufacturer, thickness, emissivity, visible transmittance, status). At the same time, the **Search** button at the bottom of the list can be used to reset search and to return back to the Find Glazing Component page, while the **Next/Previous** links, shown in the last row, allow moving between pages if the total number of records that meet specified criteria is higher than the number of displayed records per one page.

© 2010 National Fenestration Rating Council, Inc.



Clicking on either glazing component ID, or name opens the Glazing Component Detail page where all essential data about the component are displayed. Those data include glazing component server ID, file name, product name, manufacturer, source, glass type and color, as well as the glazing component main properties - thickness, conductivity, transmittance (solar, visible and infrared), reflectance (solar and visible) and emissivity.



4.7.2 Frame Component

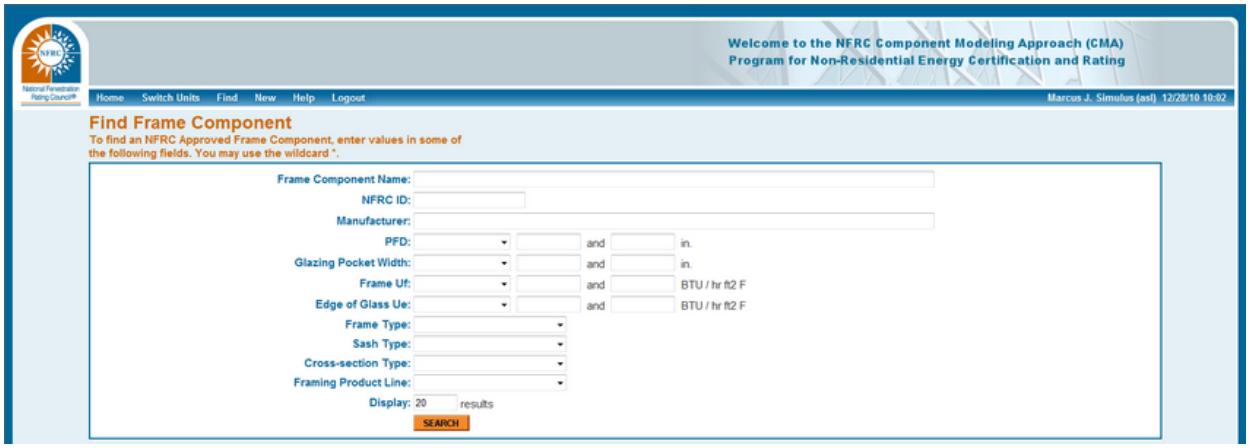
Part of the CMAST server database is designed for storing approved frame cross-section components, as well as the ones created by an ASL user in the client application, and uploaded to server for approval. Also, IA and NFRC users are provided with options to manage frame components in the database by changing their status (e.g., approving, deactivating, or reactivating them).

Similarly to glazing components, approved frame components are available for all registered CMAST users, as well as for the public access from the CMAST server Login Page. In addition, components that are submitted for review to an IA company can be

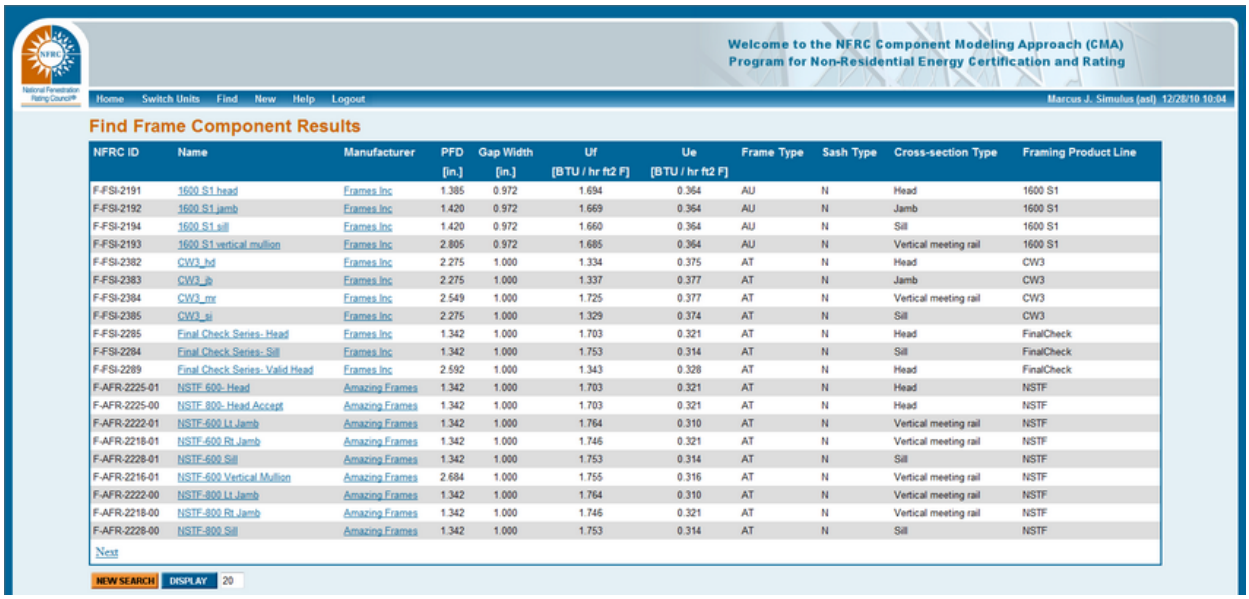
© 2010 National Fenestration Rating Council, Inc.

accessed and approved by users from that company. Also, NFRC users have access to all components, including deactivated ones.

The Find Frame Component page can be opened using the **Frame Component** option from the Find menu, and there is possible to specify several criteria for filtering frame components in the database - Frame Component Name; NFRC ID; Manufacturer; PFD; Glazing Pocket Width; U-factor values (frame and edge-of-glass); Frame, Sash and Cross-Section type; and Framing Product Line.



All frame components that satisfy specified criteria will be listed in the Find Frame Component Result page, along with their related data that include all criteria for filtering (i. e., NFRC ID, manufacturer name, PFD, etc.).



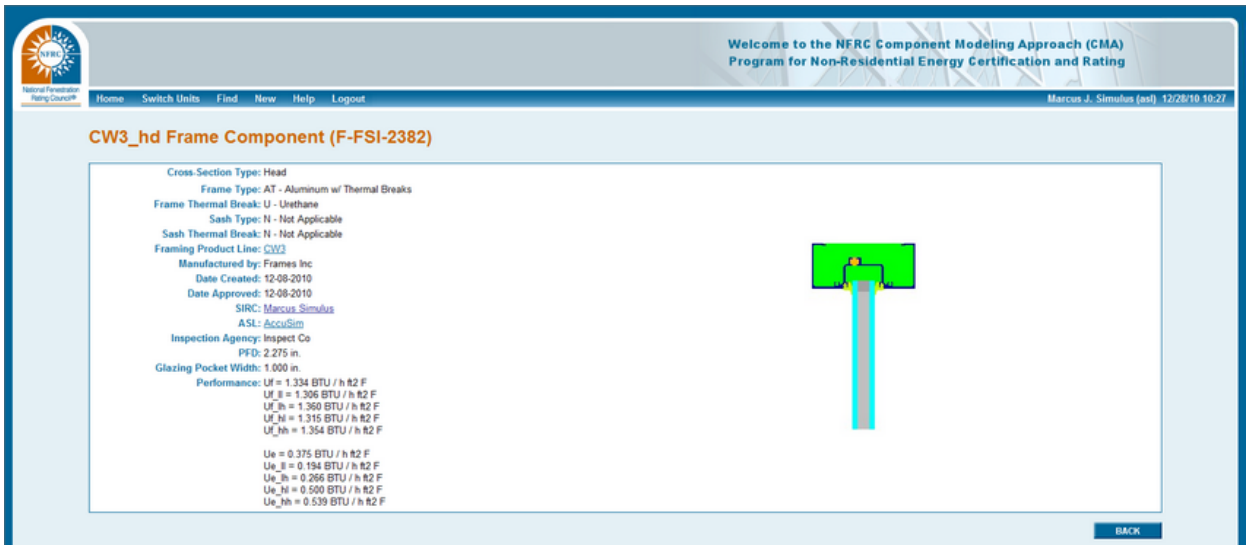
NFRC ID	Name	Manufacturer	PFD	Gap Width [in.]	Uf [BTU / hr ft2 F]	Ue [BTU / hr ft2 F]	Frame Type	Sash Type	Cross-section Type	Framing Product Line
F-FSI-2191	1600 S1 head	Frames Inc	1.385	0.972	1.694	0.364	AU	N	Head	1600 S1
F-FSI-2192	1600 S1 jamb	Frames Inc	1.420	0.972	1.669	0.364	AU	N	Jamb	1600 S1
F-FSI-2194	1600 S1 sill	Frames Inc	1.420	0.972	1.660	0.364	AU	N	Sill	1600 S1
F-FSI-2193	1600 S1 vertical mullion	Frames Inc	2.805	0.972	1.685	0.364	AU	N	Vertical meeting rail	1600 S1
F-FSI-2382	CW3_hd	Frames Inc	2.275	1.000	1.334	0.375	AT	N	Head	CW3
F-FSI-2383	CW3_jb	Frames Inc	2.275	1.000	1.337	0.377	AT	N	Jamb	CW3
F-FSI-2384	CW3_mr	Frames Inc	2.549	1.000	1.725	0.377	AT	N	Vertical meeting rail	CW3
F-FSI-2385	CW3_si	Frames Inc	2.275	1.000	1.329	0.374	AT	N	Sill	CW3
F-FSI-2285	Final Check Series- Head	Frames Inc	1.342	1.000	1.703	0.321	AT	N	Head	FinalCheck
F-FSI-2284	Final Check Series- Sill	Frames Inc	1.342	1.000	1.753	0.314	AT	N	Sill	FinalCheck
F-FSI-2289	Final Check Series- Valid Head	Frames Inc	2.592	1.000	1.343	0.328	AT	N	Head	FinalCheck
F-AFR-2225-01	NSTF 600- Head	Amazing Frames	1.342	1.000	1.703	0.321	AT	N	Head	NSTF
F-AFR-2225-00	NSTF 800- Head Accept	Amazing Frames	1.342	1.000	1.703	0.321	AT	N	Head	NSTF
F-AFR-2222-01	NSTF-600 Lt Jamb	Amazing Frames	1.342	1.000	1.764	0.310	AT	N	Vertical meeting rail	NSTF
F-AFR-2218-01	NSTF-600 Rt Jamb	Amazing Frames	1.342	1.000	1.746	0.321	AT	N	Vertical meeting rail	NSTF
F-AFR-2228-01	NSTF-600 Sill	Amazing Frames	1.342	1.000	1.753	0.314	AT	N	Sill	NSTF
F-AFR-2216-01	NSTF-600 Vertical Mullion	Amazing Frames	2.684	1.000	1.755	0.316	AT	N	Vertical meeting rail	NSTF
F-AFR-2222-00	NSTF-800 Lt Jamb	Amazing Frames	1.342	1.000	1.764	0.310	AT	N	Vertical meeting rail	NSTF
F-AFR-2218-00	NSTF-800 Rt Jamb	Amazing Frames	1.342	1.000	1.746	0.321	AT	N	Vertical meeting rail	NSTF
F-AFR-2228-00	NSTF-800 Sill	Amazing Frames	1.342	1.000	1.753	0.314	AT	N	Sill	NSTF

Next

Detailed information about particular frame component can be reviewed in the Frame Component Detail page, accessible by clicking on the component name, and it includes cross-section, frame and sash types; thermal break type; manufacturer; inspection agency

© 2010 National Fenestration Rating Council, Inc.

and performance indices of four frame component low/high options. Also, 2-D preview of the frame component would be provided if the display of the preview is enabled during the component creation in the client application (see Frame Component screen). It should be also noted that information about manufacturer and inspection agency will be displayed only if **Data Visibility** of these companies is not "My Company" providing links to corresponding Company Detail pages.



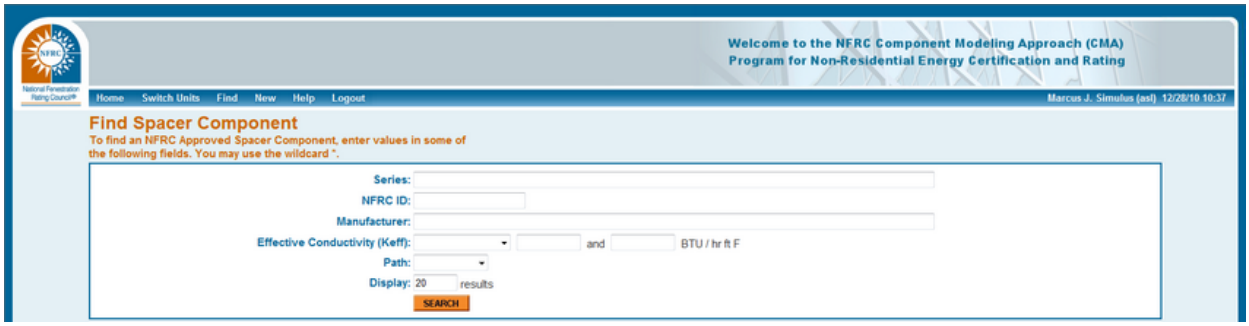
4.7.3 Spacer Component

As in case of frame components, approved spacer components are stored in the CMAST server database, and also the ones created by an ASL user in the client application, and uploaded to server for approval.

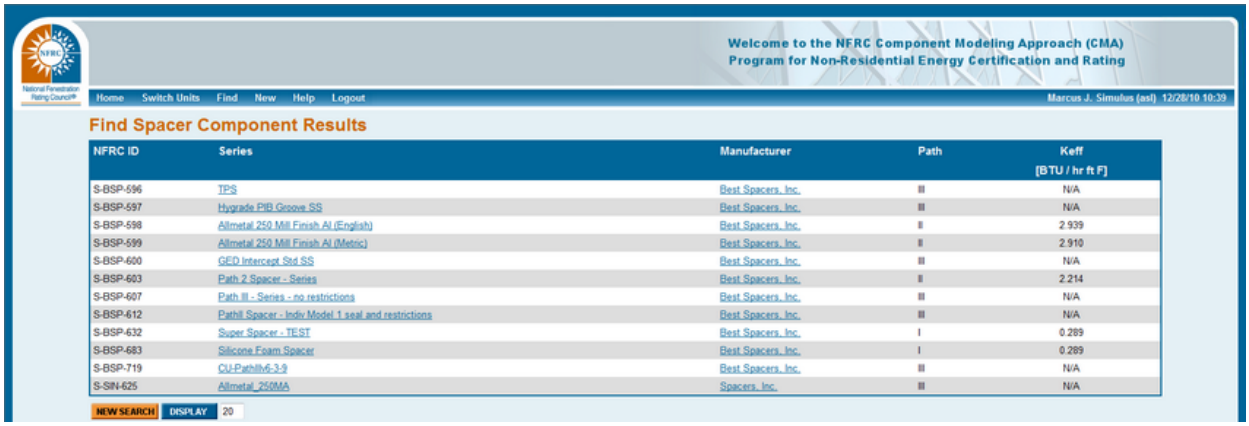
Access to approved spacer components is enabled for all registered CMAST users, as well as for the public audience from the CMAST server Login Page. Besides, components submitted for review to an IA company can be accessed for approval by users from that company and NFRC, and the NFRC will also have access to all components, including deactivated ones.

Options for browsing spacer components in the server database are available in the Find Spacer Component page, opened using the **Spacer Component** option in the Find menu. Presented search criteria include spacer component series; NFRC ID; manufacturer name; effective conductivity and definition path.

© 2010 National Fenestration Rating Council, Inc.

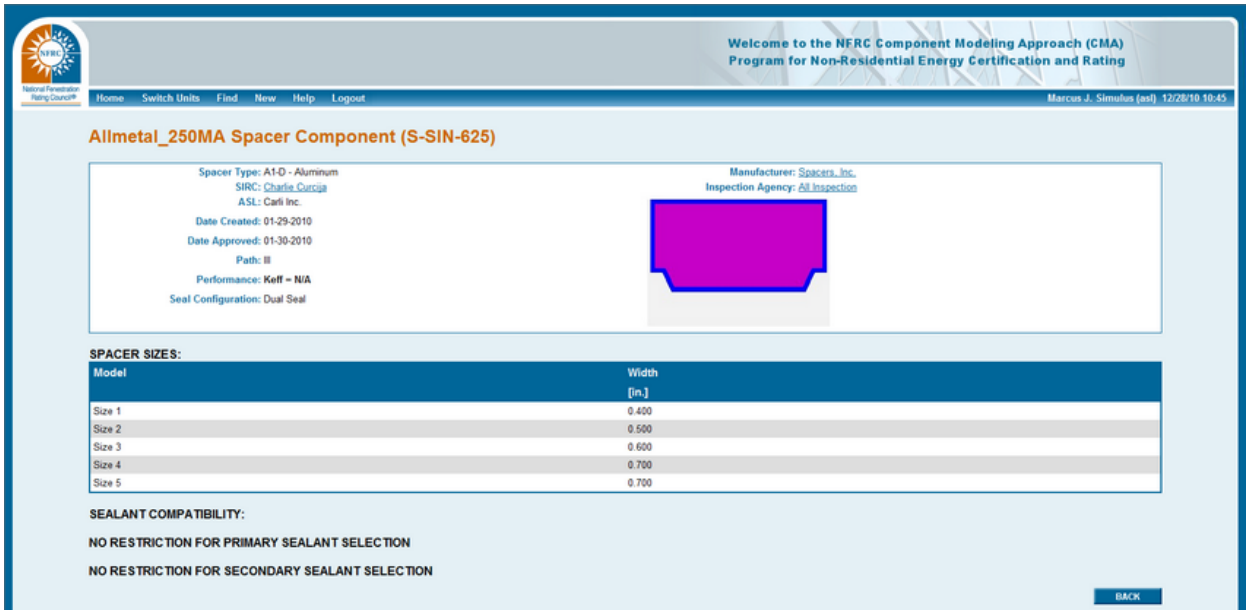


Search results will be displayed in the Find Spacer Component Result page, and for each record they include spacer series, spacer manufacturer, definition path, and effective conductivity (Keff). It should be noted that Keff values are shown just for components with definition paths I and II.



Details about particular spacer component are shown in the Spacer Component Detail page, accessible by clicking on the spacer component series. These data include spacer type, manufacturer, inspection agency, spacer sizes and performance (i.e., Keff) value. Preview image of the spacer component would be provided if its display is enabled during the component creation in the client application (see Spacer Component screen). Again, manufacturer and inspection agency names will be displayed only if **Data Visibility** of these companies is not "My Company" and will be linked with corresponding Company Detail pages.

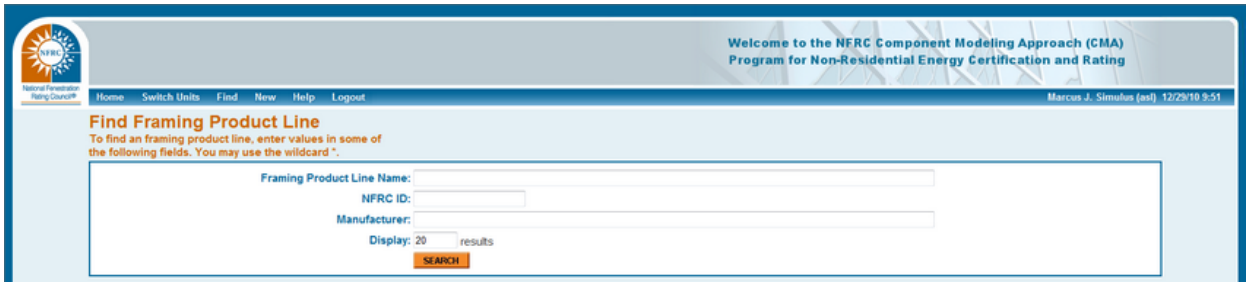
© 2010 National Fenestration Rating Council, Inc.



4.8 Framing Product Lines

Framing Product Lines are also stored in the CMAST server database. Unlike components (glazing, frame and spacer), products and label certificates, framing product lines are not available for public access from the CMAST server Login Page, but only for registered CMAST users. All registered CMAST users can access validated framing product lines, while the framing product lines in 'Validation' status are available to users from designated IA company. Finally, NFRC staff have access to all framing product lines in the CMAST server database, including deactivated ones.

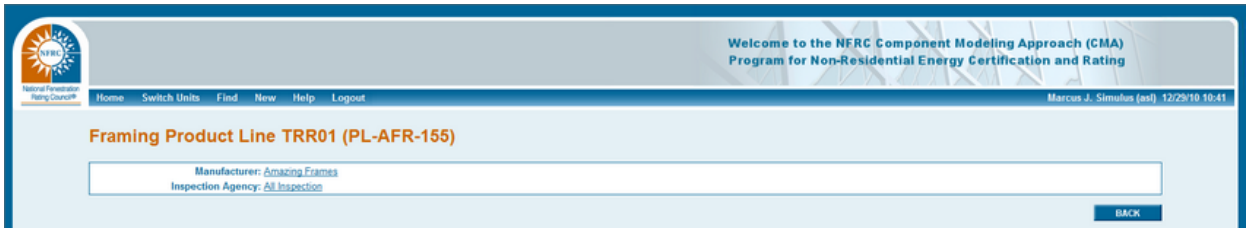
Options for browsing framing product lines are provided in the Find Framing Product Line page, and the user can open it by pressing the **Framing Product Line** option from the Find menu. Search for a particular framing product line(s) can be performed as per the following criteria - framing product line name, NFRC ID, and manufacturer, and there is also possible to adjust number of displayed records per page.



All framing product lines that satisfy specified criteria will be displayed in the Find Framing Product Line Result page along with their related data - NFRC ID, framing product line name and manufacturer.

© 2010 National Fenestration Rating Council, Inc.

Details about the each framing product line can be reviewed in a separate page that is opened upon clicking on the framing product line name. At the same time, manufacturer name represents a link that leads to corresponding Company Details page, but only if **Data Visibility** of that company is not "My Company".



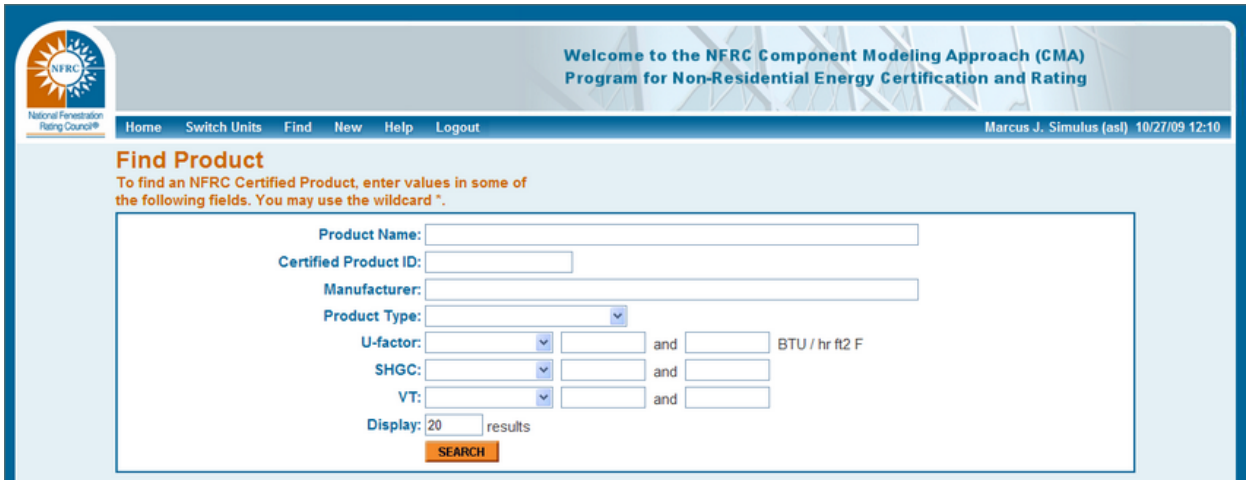
4.9 Products

4.9.1 Product

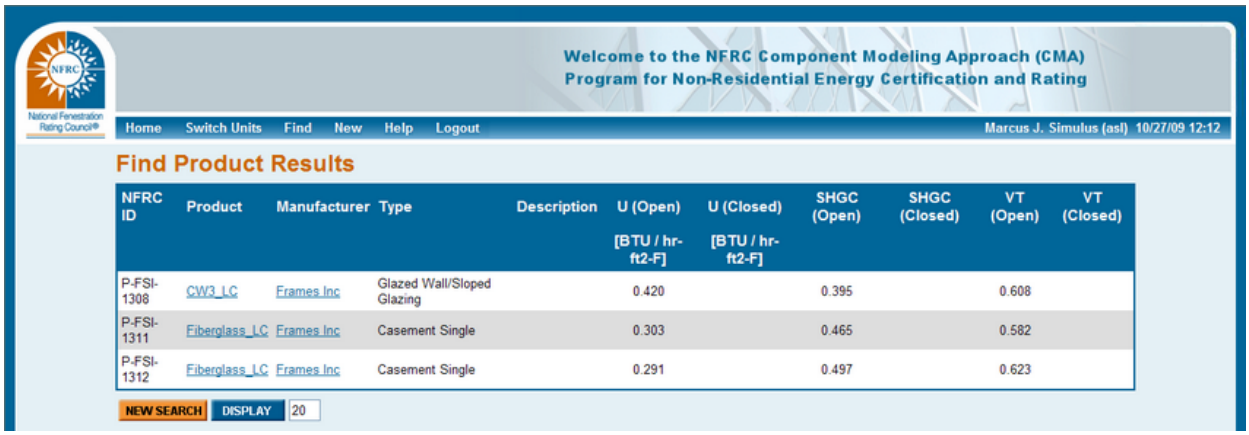
Products are also stored in CMAST server database, and the ones that are part of approved label certificates are visible to all registered CMAST users as certified products, but also available for public audience by browsing from the CMAST server Login Page. At the same time, NFRC users have access to all products in the server database, including the deactivated ones.

After login the server application, user can start Find Product page by selecting **Product** option from the Find menu. Search criteria can be set there, and available options include product name, certified product ID, manufacturer, product type and main product indices (U-factor, SHGC and VT).

© 2010 National Fenestration Rating Council, Inc.



Upon pressing the **Search** button list of all products, selected according to defined criteria, will be shown in the following page, and it will contain basic product information, like name, manufacturer, product type and main thermal indices.



More detailed information about each product in the list is presented in the Product Detail page, invoked by clicking on the product name. Information about frame and glazing manufacturers, and approved calculation entity, with names linked to corresponding Company Detail pages, are always available to NFRC users, while for other users will be displayed if the **Data Visibility** of these companies is not 'Myself'. In addition, displayed is tabulated information about the product, including its dimensions and main indices (U, SHGC and VT) for NFRC standardized size and actual size. Center-of-glazing, spacer and frame assemblies, applied in the product, are also referenced here.

© 2010 National Fenestration Rating Council, Inc.

ID	Product Type	Product Line	Glazing	Spacer	At Actual Size W [in.]	At Actual Size H [in.]	At Actual Size U [BTU / hr-ft2-F]	At Actual Size SHGC	At Actual Size VT	At NFRC Size W	At NFRC Size H	At NFRC Size U [BTU / hr-ft2-F]	At NFRC Size SHGC	At NFRC Size VT
FA-FSI-2348	Glazed Wall/Sloped Glazing	CW3_LC	GA-OCG-2280	SA-SIN-1455	96.000	72.000	0.420	0.395	0.608	78.740	78.740	0.435	0.391	0.601

Glazing Ref	Glazing Description	Glazing ID	Flip	Gap Width [in.]	Gap Fill	Glazing ID	Flip	Gap Width [in.]	Gap Fill	Glazing ID
GA-OCG-2280		103	☐	0.500	Air (10%) / Argon (90%) Mix		☐			

Spacer Ref	Spacer Description
SA-SIN-1455	

Please note that certified products are deactivated by the NFRC Staff only. Also, deactivated products will not be visible to other users, but will remain visible in label certificates that have already been issued.

4.9.2 Validation Test Report

In the process of framing product line validation, simulation results for baseline product of the framing product line, are validated against the test results. The test results are independently input in the CMAST server application by the ATL (Accredited Testing Laboratory). Testing Professional in Responsible Charge (TIRC), working for an ATL submits the test results to the IA company, which was specified during the framing product line definition.

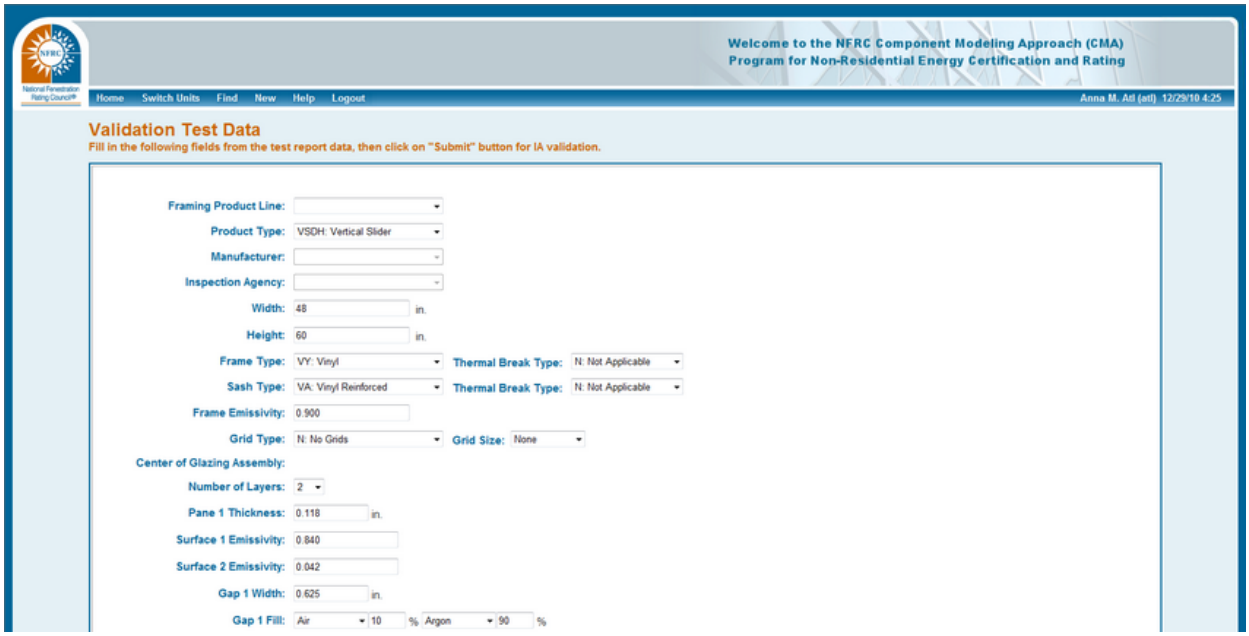
The Validation Test Data page is intended for input of the test report data, and it can be opened using the **Validation Test Report** option from the New menu. Data that need to be specified include:

- framing product line;
- product type and dimensions;
- frame details (frame and sash type; frame and sash thermal break type; frame emissivity);
- glazing system details (glass panes thickness; emissivity; gap width and gas fill)
- spacer type;

© 2010 National Fenestration Rating Council, Inc.

- product U-factor (at NFRC and user defined size);
- test date, test report number and test report date.

It should be noted that emissivity values of the glass panes surfaces must be between 0 and 1, while only air can be selected as pure gas for gap fill. Also, when gas mixture is specified for the gap fill, sum of percentage values of pure gasses in the mixture must be 100%.



When ATL fills-in a test report, it can be saved and completed later. However, for the report to be saved, product type, width and height are required fields, while all others can be left blank.

If the framing product line is not yet uploaded to the server database via product submittal for validation, corresponding field in the validation test report will remain empty (as shown in the above image). In that case, test report cannot be submitted to the IA for review and product validation, but only saved in the server database by clicking on corresponding button (i.e., **Save**) at the bottom of the page. When the framing product line is uploaded to the server, the ATL user needs to open the validation test report again, specify the framing product line and press the **Submit** button in order to send data to the IA. After that, the validation test report becomes 'locked', and no changes can be made in it.

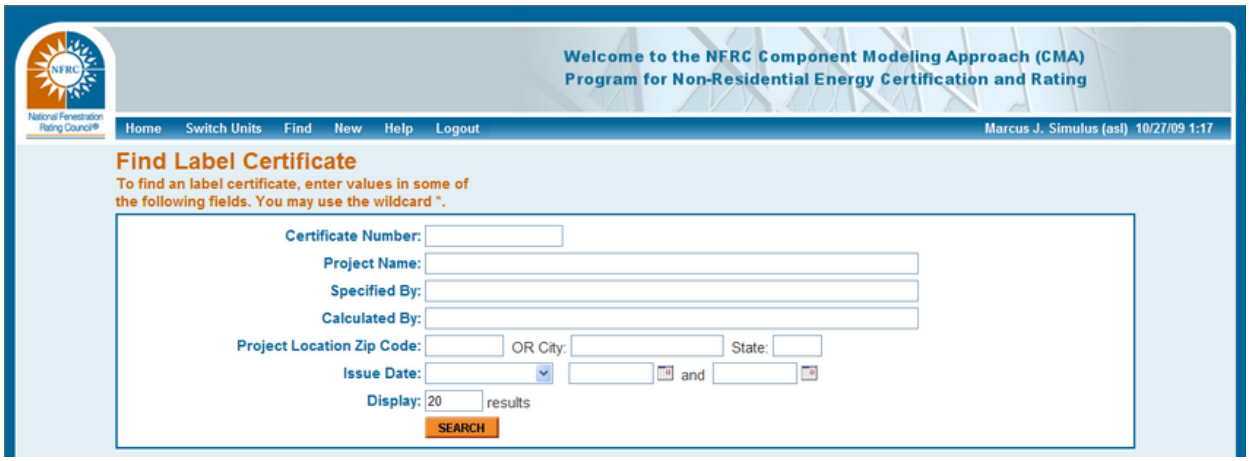
When the framing product line validation is rejected, corresponding notification is sent to ATL. Also, the Validation Test Report gets redesign status. The TIRC needs to access the Validation Test Report using the **Validation Test Data** option from the Find menu, take appropriate corrective actions (if necessary), and resubmit it by clicking the **Submit** button. Alternatively, the TIRC can also re-submit new Validation Test Report for the FPL validation, as per above procedure, and in that case the new report replaces the old one.

© 2010 National Fenestration Rating Council, Inc.

4.10 Label Certificates

Similarly to products, projects, for which label certificates are issued, are available to all registered CMAST users for reviewing, as well as for public access from the CMAST server Login Page. Users from the designated IA company can access the projects submitted for the certification and issue certificate, while NFRC users, which have access to all projects in the server database including the deactivated ones, can also issue the label certificate for the project.

Search for particular project can be performed using the Find Label Certificate page, accessible by pressing the **Label Certificate** choice from the Find menu, where desired criteria for browsing can be define.

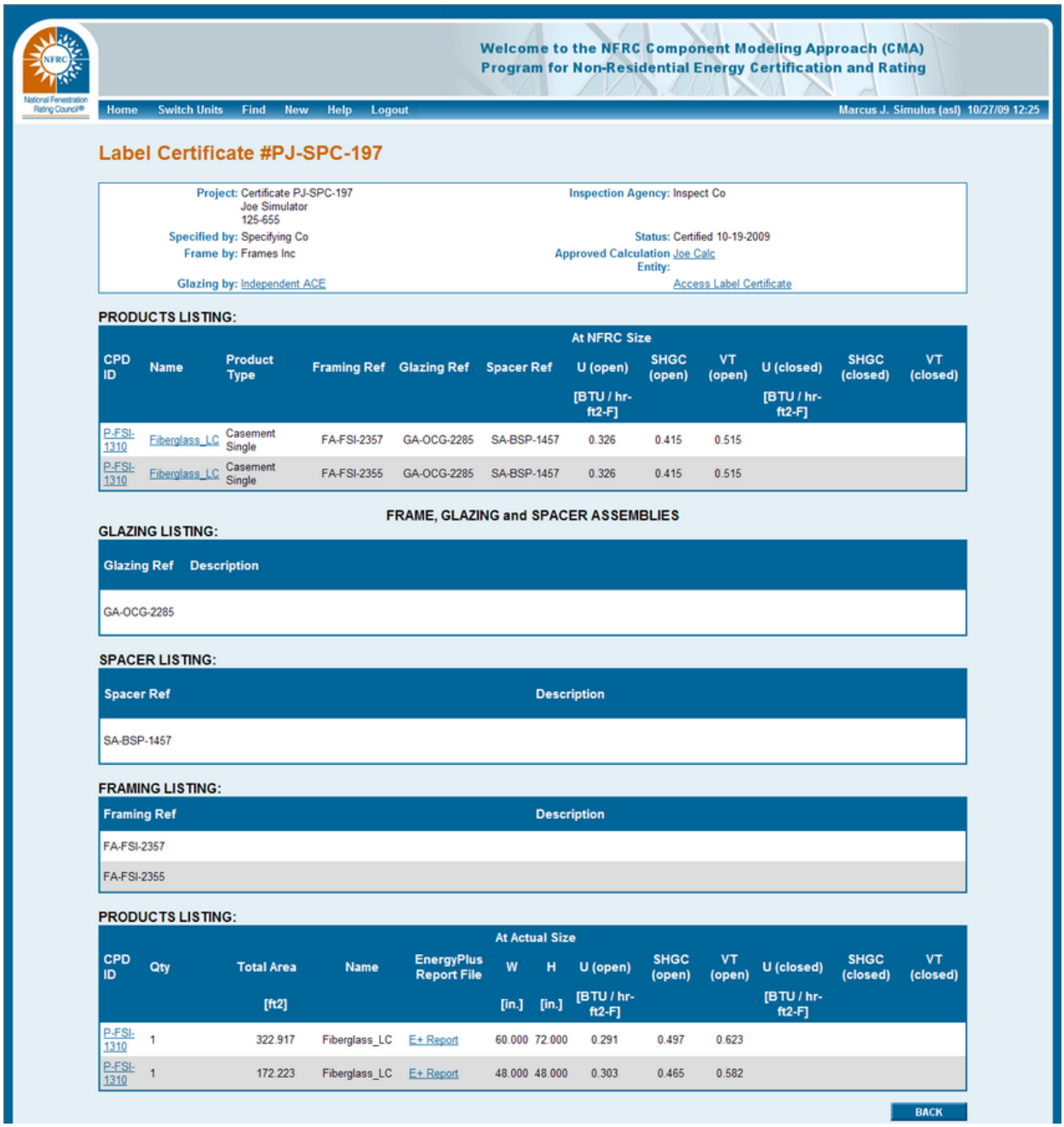


Search results will be presented in the following page, and for each record they include label certificate number, project name, specifying authority, issue date (in case of and project address.

Names of the specifying authority (SA) companies are providing links to corresponding Company Detail pages if **Data Visibility** of these companies is not 'My Company', while the clicking on the project name or certificate number opens the Label Certificate page where essential details about the project, are displayed. Upper part of the page contain information about SA, frame and glazing manufacturer, ACE and IA companies, while the listing of products in the project with their main thermal indices is displayed below. Applied center-of-glazing, spacer assemblies and frame assemblies are referenced in

© 2010 National Fenestration Rating Council, Inc.

corresponding tables in the central part of the screen. Finally, products performance at actual (user defined) size, is displayed in the table at the bottom of the page. Each product is identified with corresponding CPD ID, and the product names, quantity, dimensions, E+ reports and total area that each product is covering, are presented in addition to main indices.



Welcome to the NFRC Component Modeling Approach (CMA) Program for Non-Residential Energy Certification and Rating

Home | Switch Units | Find | New | Help | Logout — Marcus J. Simulus (asl) 10/27/09 12:25

Label Certificate #PJ-SPC-197

Project: Certificate PJ-SPC-197
Joe Simulator
125-655
Specified by: Specifying Co
Frame by: Frames Inc
Glazing by: Independent ACE

Inspection Agency: Inspect Co
Status: Certified 10-19-2009
Approved Calculation Entity: Joe Calc
Access Label Certificate

PRODUCTS LISTING:

						At NFRC Size					
CPD ID	Name	Product Type	Framing Ref	Glazing Ref	Spacer Ref	U (open) [BTU / hr-ft2-F]	SHGC (open)	VT (open)	U (closed) [BTU / hr-ft2-F]	SHGC (closed)	VT (closed)
P-FSI-1310	Fiberglass_LC	Casement Single	FA-FSI-2357	GA-OCG-2285	SA-BSP-1457	0.326	0.415	0.515			
P-FSI-1310	Fiberglass_LC	Casement Single	FA-FSI-2355	GA-OCG-2285	SA-BSP-1457	0.326	0.415	0.515			

FRAME, GLAZING and SPACER ASSEMBLIES

GLAZING LISTING:

Glazing Ref	Description
GA-OCG-2285	

SPACER LISTING:

Spacer Ref	Description
SA-BSP-1457	

FRAMING LISTING:

Framing Ref	Description
FA-FSI-2357	
FA-FSI-2355	

PRODUCTS LISTING:

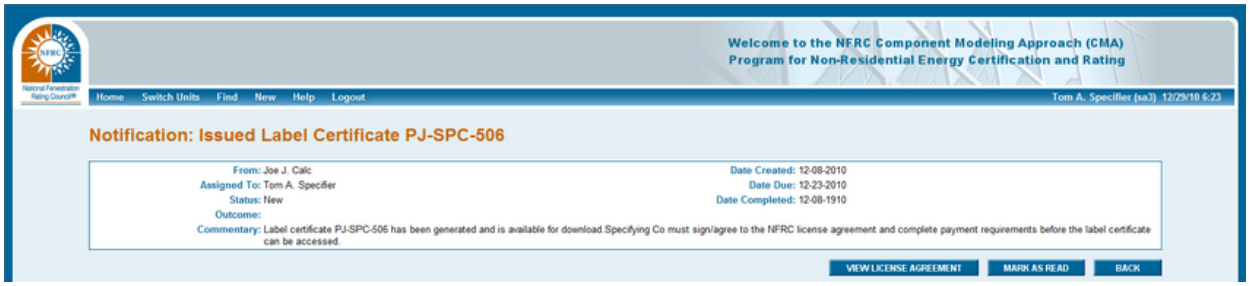
					At Actual Size							
CPD ID	Qty	Total Area [ft2]	Name	EnergyPlus Report File	W [in.]	H [in.]	U (open) [BTU / hr-ft2-F]	SHGC (open)	VT (open)	U (closed) [BTU / hr-ft2-F]	SHGC (closed)	VT (closed)
P-FSI-1310	1	322.917	Fiberglass_LC	E+ Report	60.000	72.000	0.291	0.497	0.623			
P-FSI-1310	1	172.223	Fiberglass_LC	E+ Report	48.000	48.000	0.303	0.465	0.582			

BACK

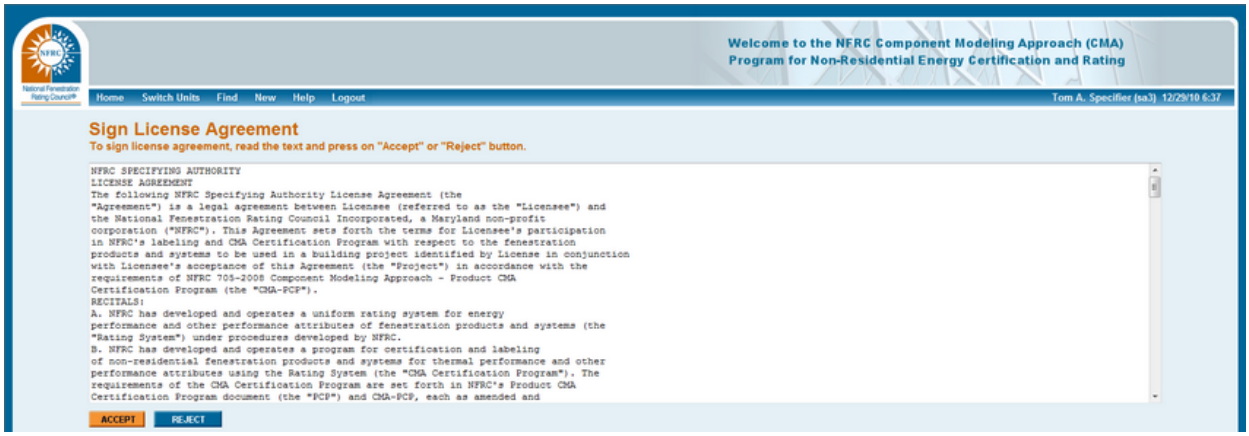
After issuing, label certificate, and associated project and products can be deactivated by the NFRC user only. Also, only NFRC user can reactivate label certificates and included projects/products.

© 2010 National Fenestration Rating Council, Inc.

Once the label certificate is issued for the project, corresponding notification is generated for designated specifying authority (SA), and it is accessible using link displayed in the Home page.



The label certificate is available to the specifying authority for review upon clicking on the **View License Agreement** button and signing NFRC license agreement by pressing the **Accept** button.



Also, necessary payments need to be made before PDF version of the label certificate can be accessed. Then, the **Access Label Certificate** link will be provided on the web page with details about the label certificate, and it leads to the label certificate in PDF format.

© 2010 National Fenestration Rating Council, Inc.

4.11 Payment and Billing

4.11.1 Types of CMA Fees

As per approved CMA Fees schedule, there are several types of fees that are handled in CMAST. These are:

1. Software usage fees;
2. Component fees;
3. Label Certificate fees;
4. Participation fees.

Some of the above fees are subject to:

- Annual fee;
- Per item (i.e., component, label certificate, etc.) fee;
- Annual component caps per company;
- Annual overall caps per company.

In addition, software usage fees are subject to per user and per company fee. Also, members of NFRC and non-members pay different rates, since a separate fee schedule is applied for each category.

1. Software Usage Fees

CMAST client software is subject to license fees as follows:

- Initial license fee
  - Per Company fee (includes first user)

© 2010 National Fenestration Rating Council, Inc.

  - Per User fee
- Annual license renewal fee (Maintenance fee)
  - Per Company fee (includes first user)
  - Per User fee.

The first six months of software usage (also known as "trial period") are offered at no charge (e.g., "free" use). The trial period starts from the moment the user has been approved, and there is one trial period per company, meaning that additional users pay usage fee as soon as they start using software. User will be able to use software before it is paid, but NFRC will have option to suspend user if the usage is not paid after delinquency period. For users registered during the pilot program, the trial period expires on June 30th, 2010. In addition, users paying more than $7,000 in CMA program fees have free use of the software. After the trial period expiration, CMAST sends notification to the Company billing contact, and a copy to both the NFRC Accounting user and and software user, that the initial fee needs to be paid.

Each calendar year on the first business day in January , CMAST will generate an invoice for the software maintenance fee and send it to the user and company representative, and forward a copy to the NFRC Accounting user. Software prices are not pro-rated, so user pays initial fee in the calendar year that the software license was purchased and pays maintenance fee on the first business day in the next calendar year, regardless when was initial purchase made. Software maintenance fees are also not pro-rated. When six months trial period expires, software usage fees are generated for each user in the company and for each new user in company that registers until the end of the year, if user is subject to software usage fee.

Some users are not subject to software usage fees. Users from the following companies - Accredited Simulation Labs (ASL), Accredited Testing Labs (ATL), Approved Calculation Entities (ACE) and Certification and Inspection Agency (IA) will receive free license if they are listed as certified simulators or ACEs; otherwise they will be subject to license fee. If the user from the company that receives free software license is registered user, the company is not required to pay initial license fee; however, user is charged license fee.

2. Component Fees

Components are subject to per approved component fee, and are also subject to an annual cap. Fees are accumulated and billed quarterly using the following formula:

QP = CF * N / 4

Where:

QP = Total quarterly payment;

CF = Per component annual fee;

N = number of components in the CMAST library as of the last day of the quarter.

Component fees are collected quarterly, i.e., at the end of each quarter, a cumulative billing statement is generated and sent via email to the company billing contact; a copy is also sent to the NFRC Accounting user. Payment is subject to standard ‘net 30’ payment terms

© 2010 National Fenestration Rating Council, Inc.

and can be paid online or off-line, as described in the Payment Process section.

Components and annual participation fees are subject to a per-company annual and overall cap. Annual fees are pro-rated for the first year of participation. The preliminary invoice total is added to previously-billed amounts, and this total is subtracted from the cap. If the resulting amount is smaller than the amount calculated using the equation above, CMAST bills the smaller amount and does not bill for components issued after this quarter for the remainder of the year. All billing is reset each year, and starts from $0.00 each January 1st.

Pro-rated component participation fees are generated at the start of the next quarter after company registration. Component fees are not pro-rated and are charged for the number of components that are in the library at the time of quarterly fee generation.

3. Label Certificate Fees

Specifying authorities (SA) are charged a fee per each label certificate generated. Fees are dependent on the size of the project, where size is defined as the total window area in the project. Label certificates are also subject to program caps for each company. The preliminary Label Certificate fee is added to previously-billed amounts, and this total is subtracted from the cap. If the resulting fee is smaller than the fee provided in the CMA Label Certificate Fee Schedule, CMAST bills the smaller amount and does not bill for additional Label Certificates issued for the remainder of the year. All billing is reset each year, and starts from $0.00 each January 1st.

4. Participation Fees

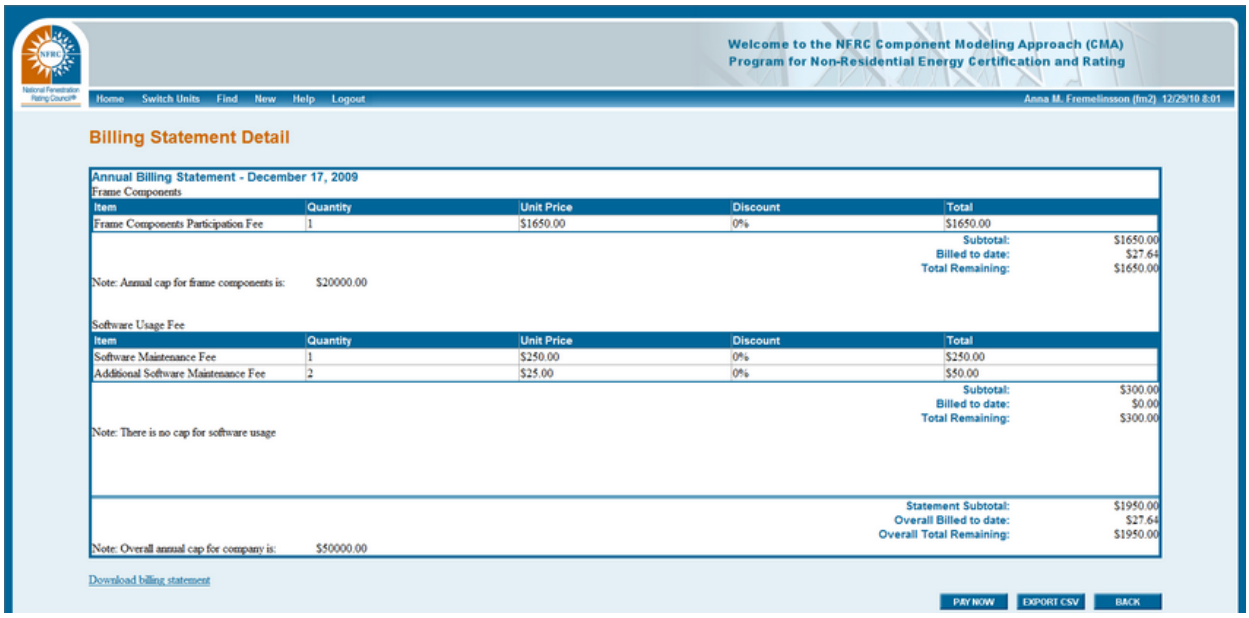
Companies pay annual CMA participation fees. Annual participation fees will cover all areas of participation, which means that multiple participation fees will not be charged if a company participates in more than one area of the CMA Product Certification Program (e. g., if the one company is submitting both frame and glazing data, and also acting as a Specifying Authority obtaining project certificates).

4.11.2 Company Billing Pages

Billing pages are provided in the CMAST server application for each registered company. They can be accessed only by the company billing contact using either the **Billing** link in the Home page, or the **Billing** button in the Company Details page.

© 2010 National Fenestration Rating Council, Inc.

List of all company's billing statements for current calendar year is displayed by default, and prior year statements can be accessed by selecting appropriate year from the drop-down list. Each statement name represents a hyperlink, which leads to the page where all details about the statement are displayed. There is also possible to export the statement into Comma Separated Value (CSV) file format, as well as to download it as PDF file.



If the payment status is "Unpaid", the company billing contact can access the **Process Payment** page using the **Pay Now** button, and proceed with payment as described in the next section.

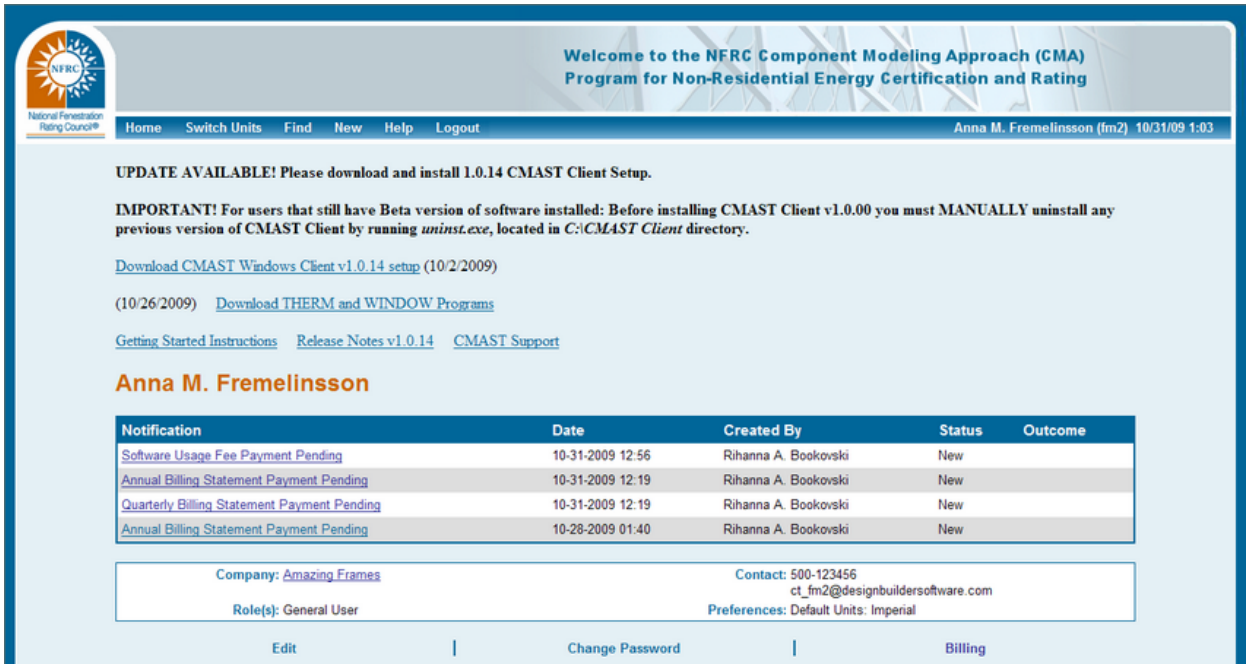
Pressing the **Order Confirmations** button at the top of of the **Billing Statements** page opens corresponding page where all order confirmations for the company in current calendar year are listed, and, as in case of billing statements, prior year confirmations can be selected from the drop-down list.

Order confirmation details are available in corresponding page, opened by clicking on the order confirmation name, and there is also possible to export the order confirmation in csv format, and download it in pdf format.

© 2010 National Fenestration Rating Council, Inc.

4.11.3 Payment Process

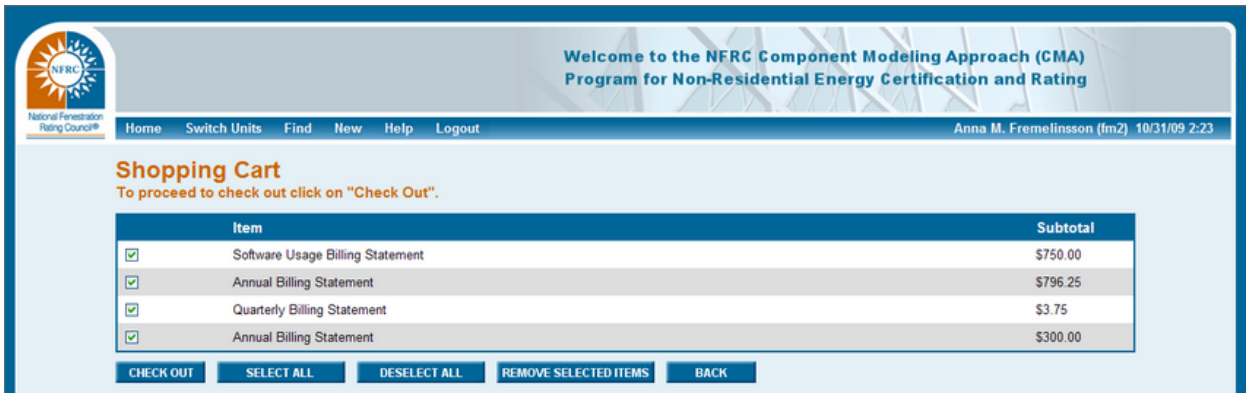
Once an invoice/billing statement is generated in CMAST by the NFRC Accounting user, corresponding notification is sent to the company billing contact with “net 30” payment terms (i.e., the payment is due within 30 days of the notification). Label certificate fees are collected at the time of download, so invoice is sent by email after each label certificate is downloaded. The company billing contact receives email notification, with the billing statement in pdf format as an attachment. Also, a notification is shown when the billing contact logs in to CMAST Web application.



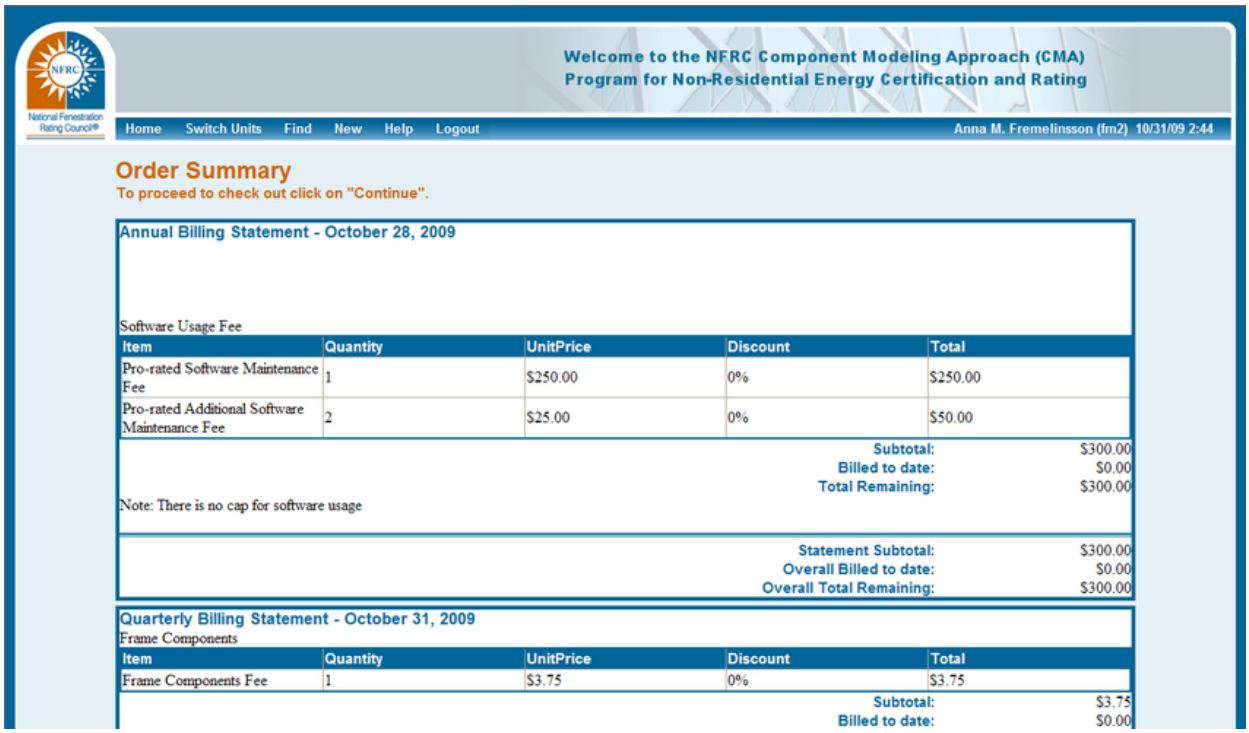
Clicking on the notification opens the notification details page, where the company billing contact can use the **Pay Now** button to get the list of pending payments and select billing statements to pay. Selection of all pending payments can be done using the **Select All** button, while individual payments are selectable by checking corresponding boxes.

© 2010 National Fenestration Rating Council, Inc.

Pressing the **Add Selected Items to Shopping Cart** button provides access to page with the list of all billing statements included in the shopping cart. In order to proceed with payment, the company billing contact needs to select billing statements that are intended for payment and press the **Check Out** button.



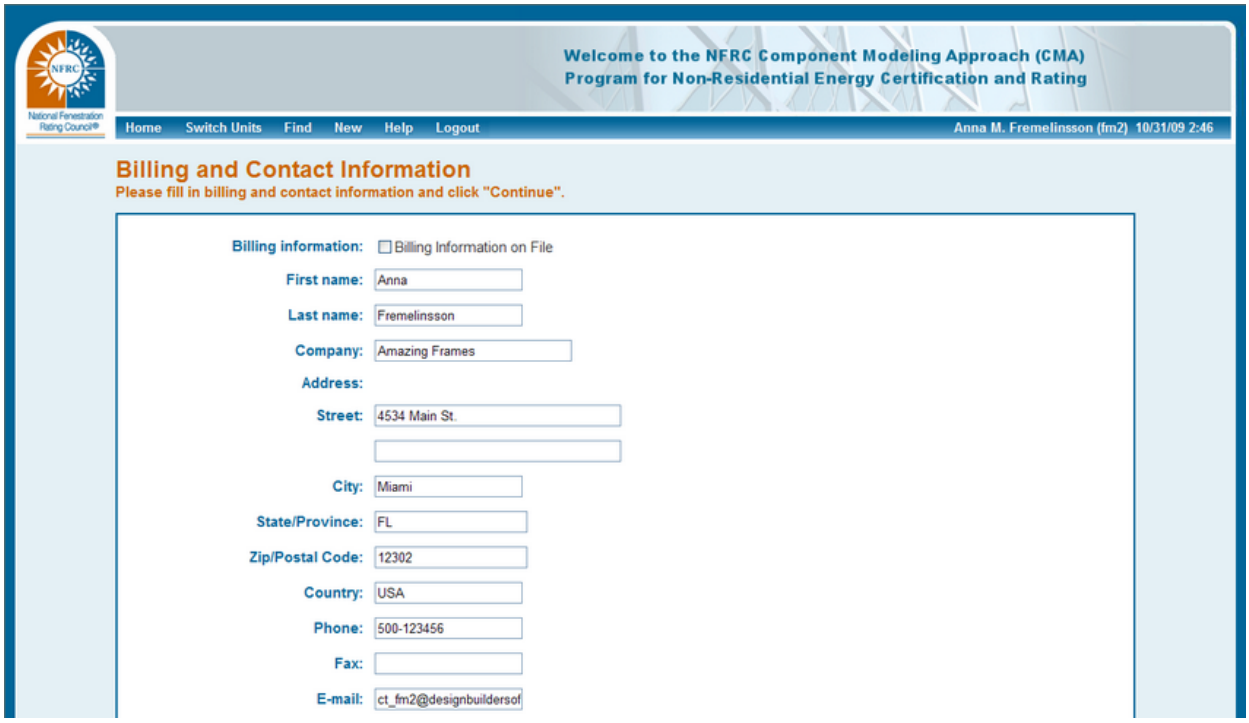
Details about all billing statements that are indented for payment are displayed in tabular manner in the **Order Summary** page. The payment process can be continued by clicking on corresponding button at the bottom of the page.



The **Billing and Contact Information** page is shown next. Details about company billing contact are displayed as read-only in the contact information section, while details about the person who performs payment need to be input through the fields in the billing

© 2010 National Fenestration Rating Council, Inc.

information section. By checking the **Billing Information on File** box data about company billing contact will be automatically input as billing information.



Upon completion of the billing and contact information and pressing the **Continue** button, company billing contact gets access to the **Order Confirmation** page. Contact Information and Billing Information details are displayed in the top part of the page, while the details about all billing statements selected in payment are displayed below similarly as in the **Order Summary** page.

© 2010 National Fenestration Rating Council, Inc.

By clicking on corresponding buttons at the bottom of the **Order Confirmation** page (i.e., **Online Payment** and **Mail Payment**, respectively) company billing contact can pay using online payment system, or mail the check or credit card information to NFRC in the traditional manner (i.e., “outside” of CMAST). If the mail payment is selected, corresponding notification is sent to NFRC Accounting users, and the company billing contact can download order confirmation and include in the mailed payment. Please note that current **Online Payment** and **Mail Payment** pages are for test only, and will be replaced with actual pages.

When the the payment made using the online payment system is successfully processed, its status is immediately updated to “Paid”. In case of mail payment, status “Pending” remains until the payment is received and processed. Then, the payment status is updated to "Paid" by an NFRC Accounting User after accessing the particular Order Confirmation and clicking on the **Payment Received** button. If the check bounces, the NFRC Accounting user needs to click the **Payment Declined** button, which would result in notification that is sent to the company billing contact indicating that the check did not clear and that additional fee (if any) was added to the statement. In this case, the order confirmation is reset back to "Unpaid" status and the billing contact can repeat the whole payment process, either by mailing another check or by completing online transaction.

For payments that are 30 days overdue, first reminder email notice is generated and sent to the company billing contact. For payments that are 60 days overdue, second reminder email notice will be sent to company billing contact and company representative. If the payment is 75 days overdue, a delinquency email notice will be sent to the company billing contact and company representative with information that all company users are suspended from the program. Copy of the notification is also sent to the NFRC Accounting

© 2010 National Fenestration Rating Council, Inc.

User.

Once a company is delinquent, NFRC Staff user deactivates users affiliated with the company. Their status is set to “Suspended”, until the payment is received, at which time NFRC Staff reactivates them.

© 2010 National Fenestration Rating Council, Inc.

5. Appendix A: Addendum to THERM 6 User's Manual

GENERATING THERM FILES FOR CMAST:

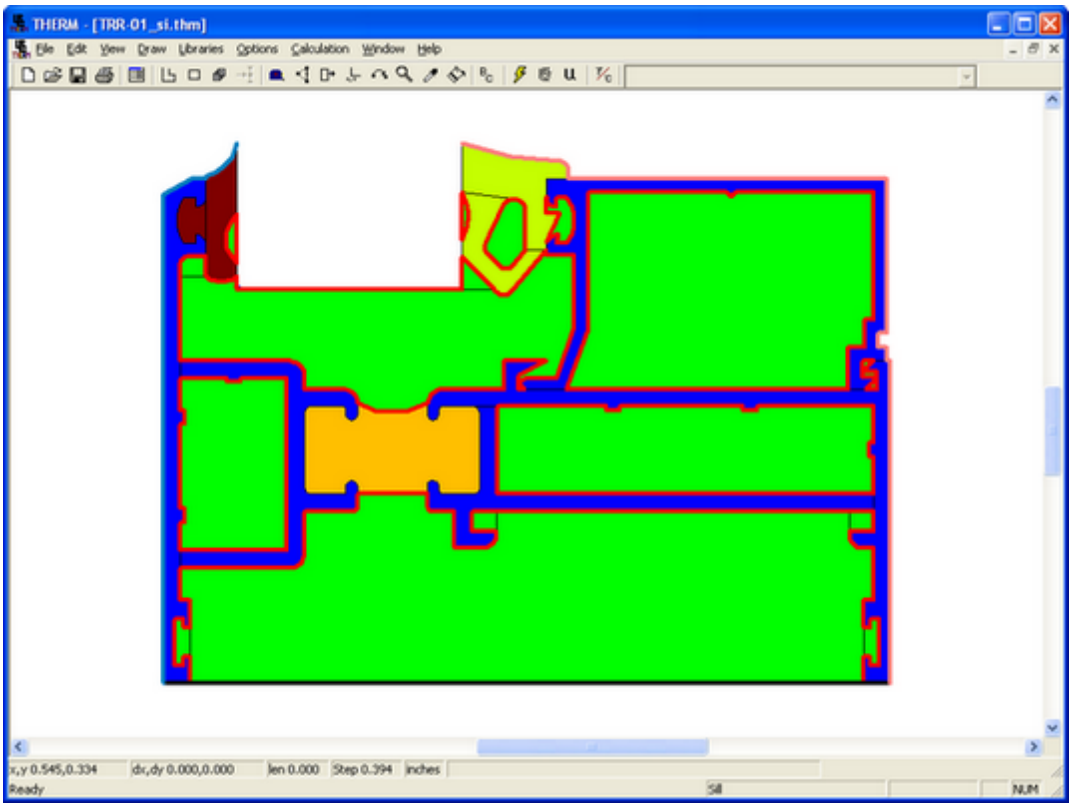
Frame cross-sections should be generated in latest THERM version (6.3.19). This version is posted on the LBNL web site (http://windows.lbl.gov/software/therm/6/index.html).

After THERM 6.3 has been installed, frame cross-section or spacer cross-section can either be edited from one of old THERM 5 files, or created from scratch. The creation of frame or spacer 2-D geometry is identical to the process in THERM 5. The difference in THERM 6.3 is in generating L/H glazing and spacer options for frames, assigning attributes for spacers and in creation of the new .thmx (xml based) file.

Frames:

The following are the steps to create CMAST compliant frame component:

1. Draw the basic 2-D frame cross-section in THERM (or open older THERM 5 file and delete any existing glazing and spacer system). The geometry should look something like the image below.

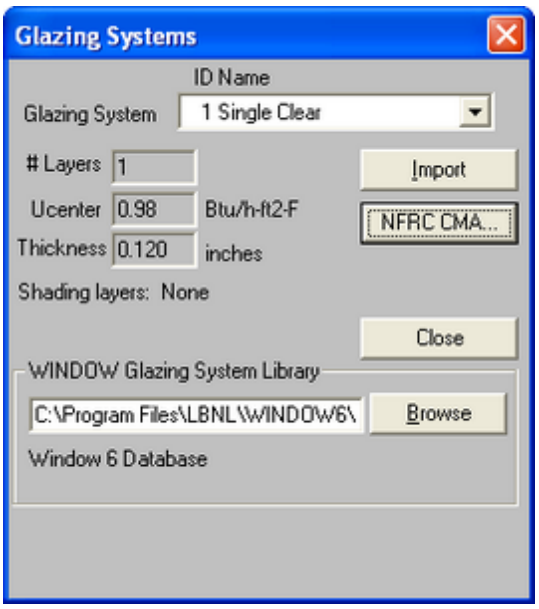


2. Set the locator for glazing system.

© 2010 National Fenestration Rating Council, Inc.

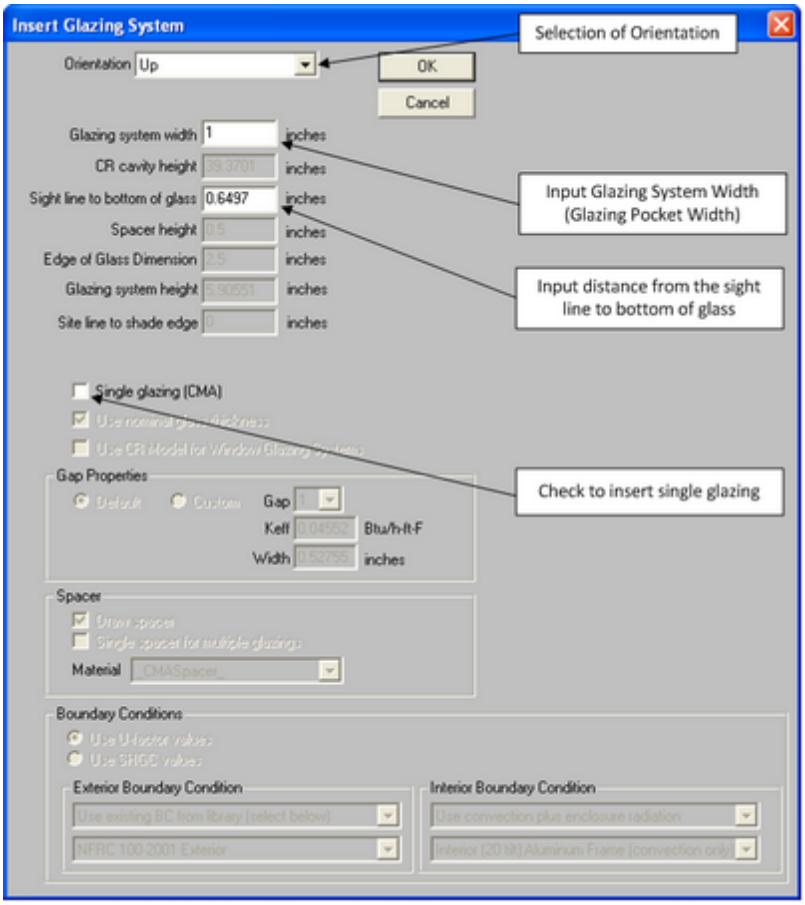
3. Select Libraries/Glazing System (or F6).

4. Click on “NFRC CMA…” button below Import button.



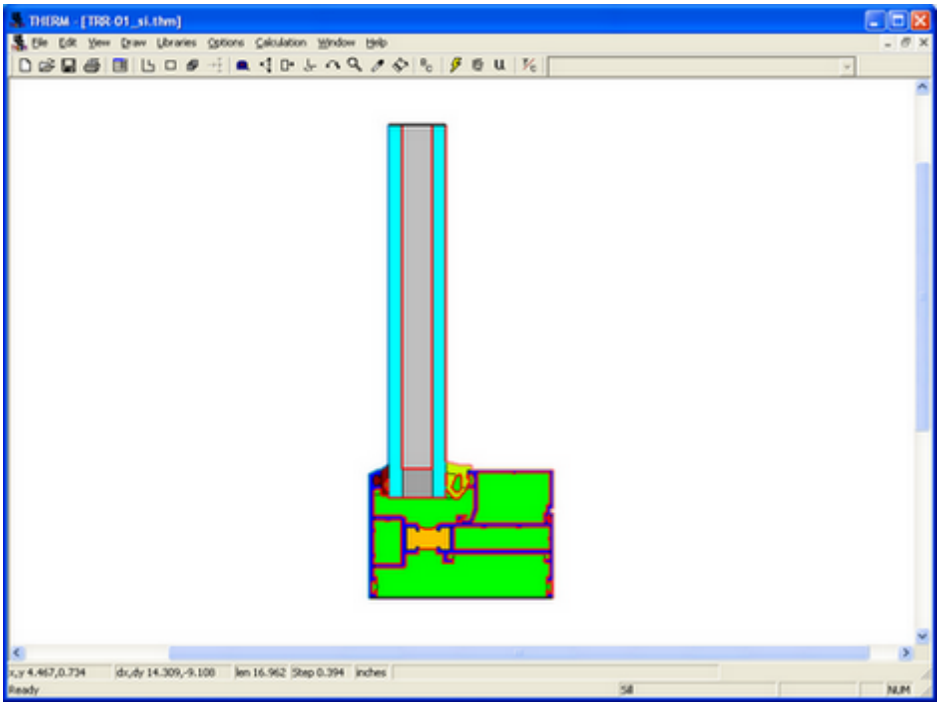
5. On the next pop-up screen select Orientation, and input Glazing system width (also known as Glazing pocket width) and distance from the sight line to the bottom of glass.

© 2010 National Fenestration Rating Council, Inc.

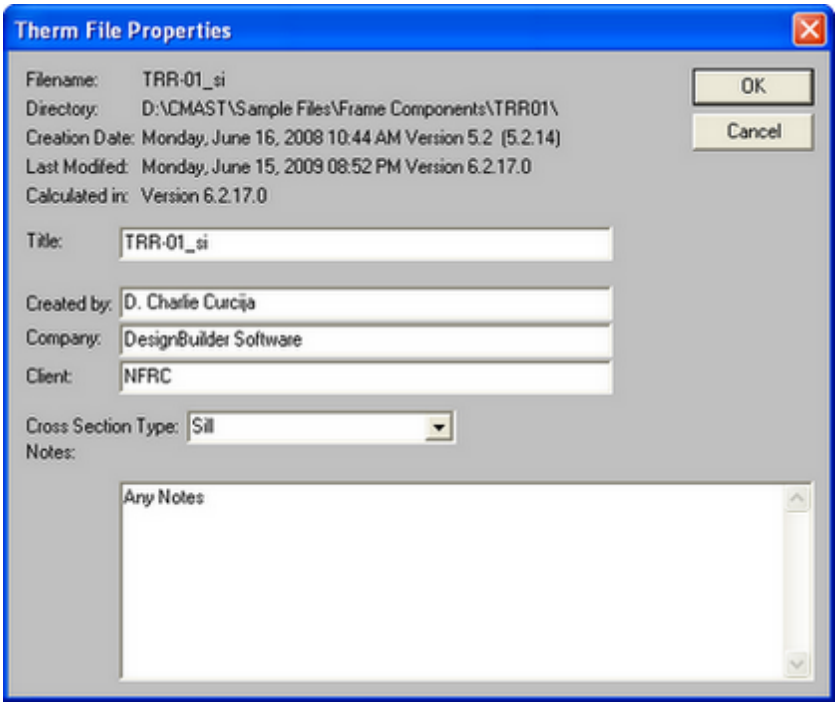


6. Press OK. The following image shows how CMA L/H glazing and spacer appears on the main screen. This process has really generated 4 L/H options, which will be simulated and saved in succession when Calculate is requested.

© 2010 National Fenestration Rating Council, Inc.



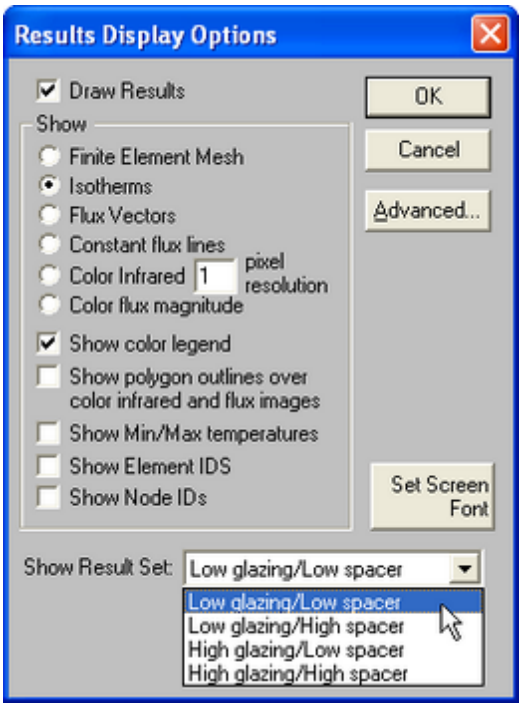
7. On the main THERM screen, select File/Properties and input the rest of general information, such as Title, Created By, Company, Client and Notes, as appropriate (this information is optional).



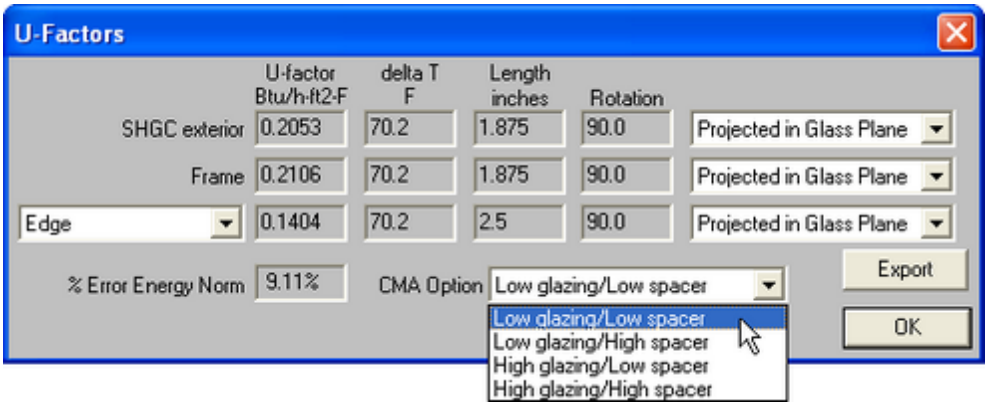
8. Save file.
9. Click on Calculate.

© 2010 National Fenestration Rating Council, Inc.

10. Follow status bar and when all calculations are completed (there will be 4 sets of calculations for each of the four L/H options), save file.
11. After the calculation completion it is possible to review the results (isotherms, IR plots, etc) for all four L/H options. To do that user needs to select Calculation/ Display Options on the main menu, and specify type of results and particular L/H option that wants to review.



Calculated U-factor values for each option can be also reviewed by selecting Calculation/Show U-factors from the main menu, or clicking on corresponding toolbar button.



In the simulation directory, there will be two files with identical file names, but different extension. One is .thm and the other is .thmx. CMAST reads results from the .thmx file.

Note 1: \":/\?><|=;[]^ characters should not be used for any name, either material,*

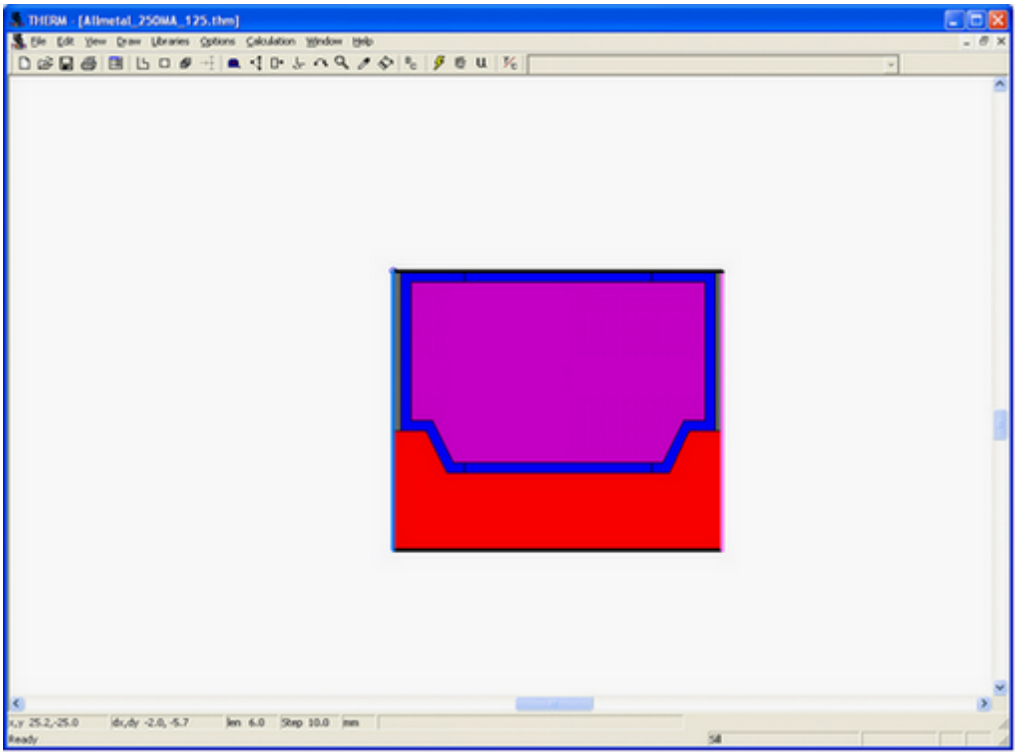
© 2010 National Fenestration Rating Council, Inc.

boundary condition, or attribute. This sign is reserved in XML format and will create invalid thmx file, if used. THERM may incorporate "cleanup" routine and replace such characters in the future with an underscore, but until then, these characters should be avoided.

Spacers:

The following are the steps to create CMAST compliant spacer component:

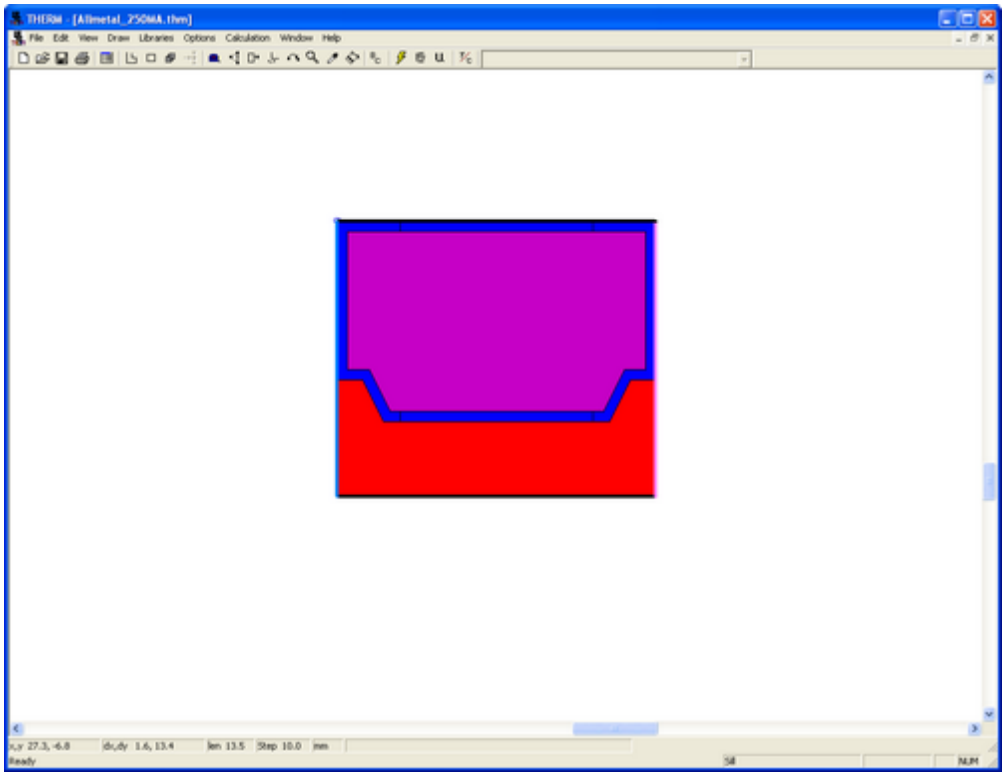
1. Draw the basic 2-D spacer cross-section in THERM (or open older THERM 5 file with spacer geometry). The geometry should look something like the image below.



2. Note that there are distinct parts of spacer system geometry, such as spacer bar, desiccant, primary (on both sides of the spacer bar) and secondary sealant (below the spacer bar and primary sealants).

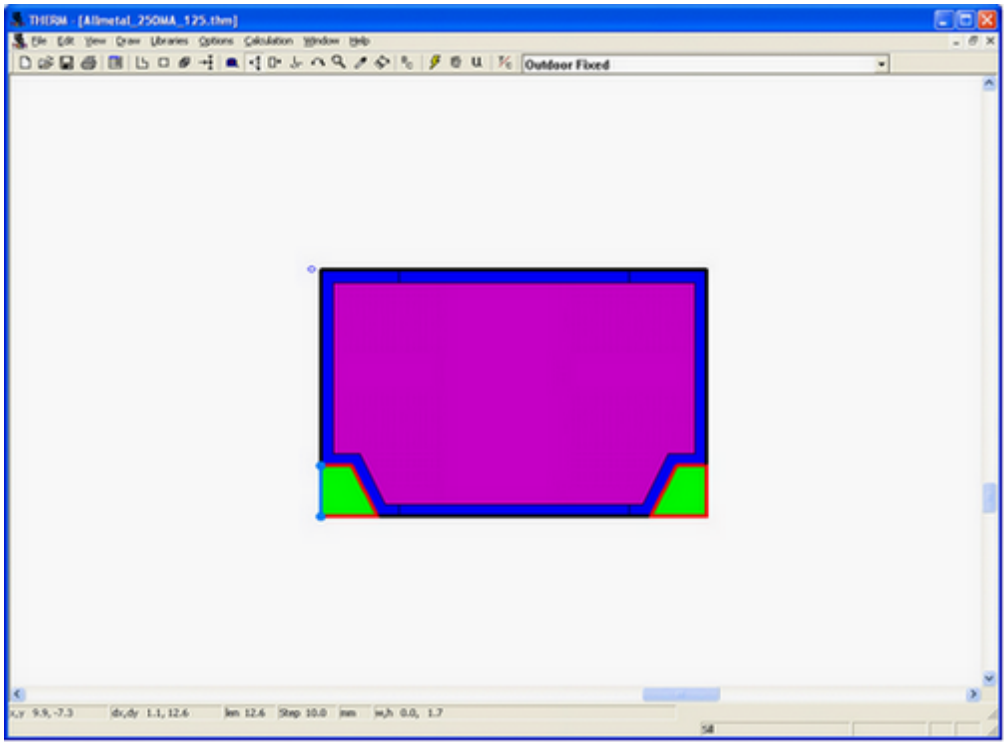
3. Depending on the intended use of the spacer system, there are several scenarios:
   a. If the spacer system is intended to be used with both primary and secondary sealants ("Dual Seal" configuration), but could also be used with secondary sealant ("Single Seal" configuration), or no sealants at all ("No Sealants" configuration), it needs to be drawn with both primary and secondary sealants, as shown in above figure.
   b. If spacer system is intended to be used with secondary sealant only ("Single Seal" configuration), but could also be used with no sealants also ("No Sealants " configuration), then only secondary sealant should be drawn, while primary sealants should not be drawn. See figure below.

© 2010 National Fenestration Rating Council, Inc.



c. If the spacer system is intended to be used with no sealants only ("No Sealants" configuration), it should be drawn without primary and secondary sealants. Final shape of the spacer system still needs to be adjusted to be rectangular in shape using air pockets (Frame Cavity NFRC 2001), as shown below.

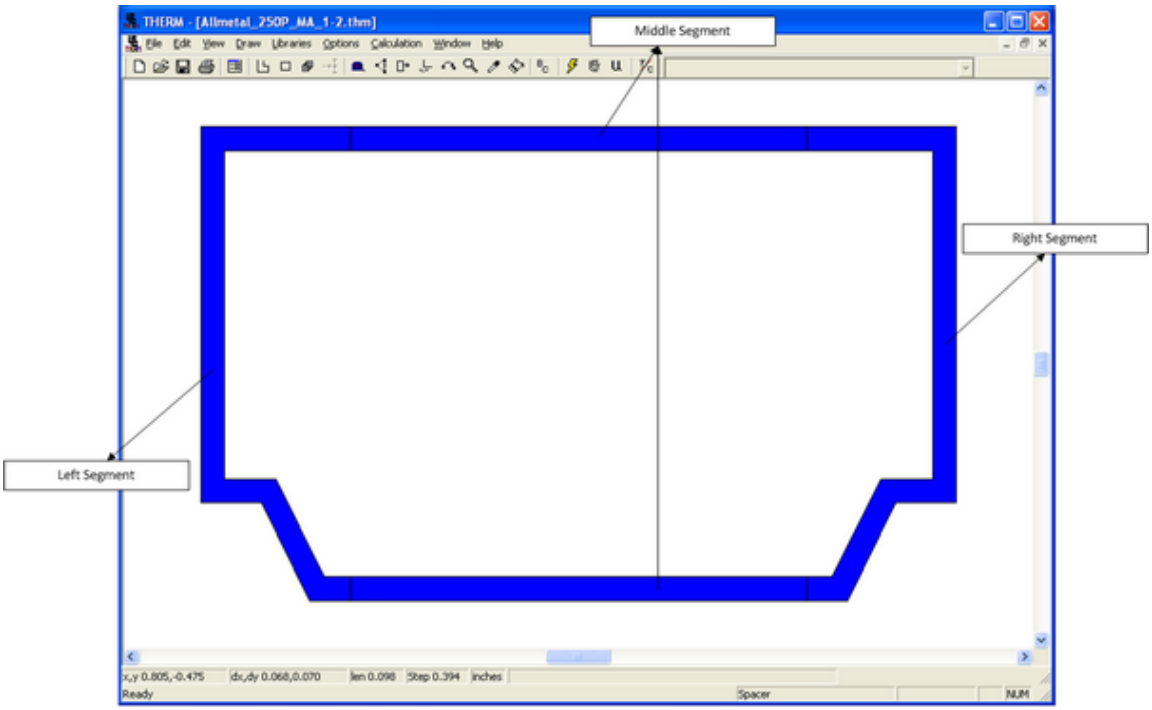
© 2010 National Fenestration Rating Council, Inc.



4. Primary and secondary sealant should meet the following criteria, so that THERM file with spacer model can be successfully imported in CMAST:
   a. **Primary Sealant** - for "Dual Seal" configuration THERM model must contain both primary sealant and secondary sealant, as indicated above. Primary sealant is defined as two polygons with the same width and with 'Primary Sealant' attribute assigned, placed on left-most and right-most positions in the model. Also, outer edges of both primary sealant polygons must be a vertical line, while the top edges of both polygons must be horizontal.
   b. **Secondary Sealant** - in case of "Single Seal" configuration THERM model must contain at least secondary sealant. Secondary sealant is defined as one single polygon with "Secondary Sealant" attribute, placed at the bottom of the spacer. Also, left and right side of the "Secondary Sealant" polygon must be a vertical line and should match the left side and right side of the overall spacer model. Otherwise, secondary sealant is not resizable. In case of "Dual Seal" configuration, when THERM model must contain both primary and secondary sealant polygons, primary and secondary sealants must be made of different materials. But, choice of materials is relatively arbitrary, since for Path II, CMAST applies generic materials regardless of the choice of materials in THERM file. Alternatively, spacer model with both primary and secondary sealant can be used for "Single Seal" configuration, in which case CMAST client application would automatically remove primary sealant.
5. CMAST enables automated resizing of spacer components for creation of all component sizes in the matrix, if the spacer bar had been prepared using “three segmented” approach. Note in the drawing below that the spacer bar is divided into

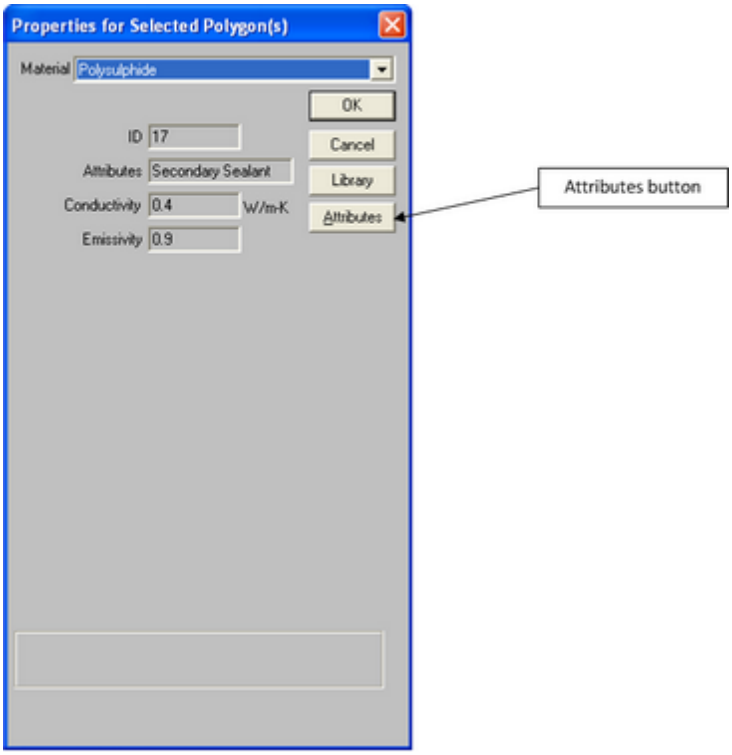
© 2010 National Fenestration Rating Council, Inc.

Left, Middle and Right segment polygons, which are joined into a single spacer bar.



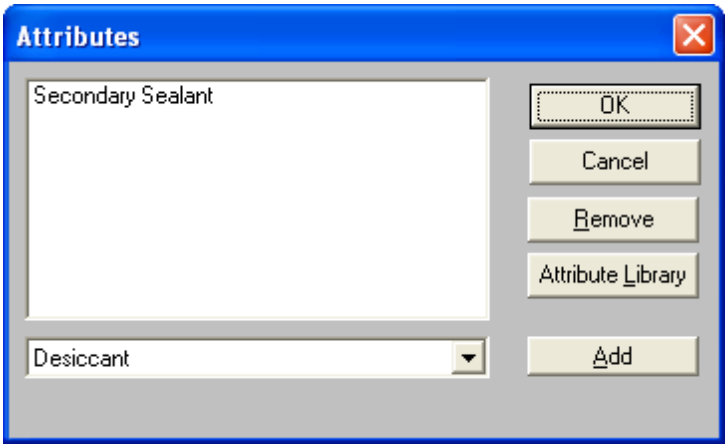
6. In order for CMAST to recognize different parts of the spacer, THERM 6 provides new functionality called Attributes. Attributes for each of different parts of the spacer should be assigned. Attributes have fixed format and are accessed from the “Set Material” (or by double clicking on the polygon). Figure below shows this screen and Attributes button.

© 2010 National Fenestration Rating Council, Inc.



7. The following attributes are used in CMAST:
   a. Left Segment
   b. Middle Segment
   c. Right Segment
   d. Primary Sealant
   e. Secondary Sealant
   f. Desiccant

   These attributes are assigned by pressing Attribute button and assigning appropriate attribute to the given polygon. Figure below shows Attributes screen.



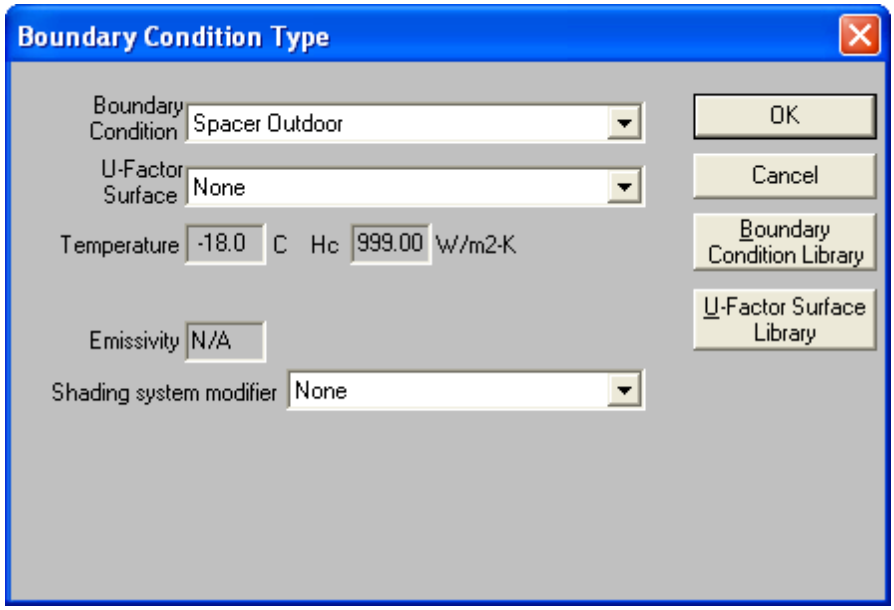
© 2010 National Fenestration Rating Council, Inc.

Note that attribute assignment is not complete until Add button is pressed. So, first select attribute from the drop down menu and then press Add button. The attribute should appear in the left upper part of the screen. Assignment process is finalized once OK button is pressed.

8. The next step is to assign boundary conditions for the spacer system model. Left and right vertical sides will need to be modified as follows:

   a. Left vertical segments (all of them, with no exceptions) should be assigned "Spacer Outdoor" boundary condition. This boundary condition is included with the latest installation of THERM 6, and to assign it, do the following:

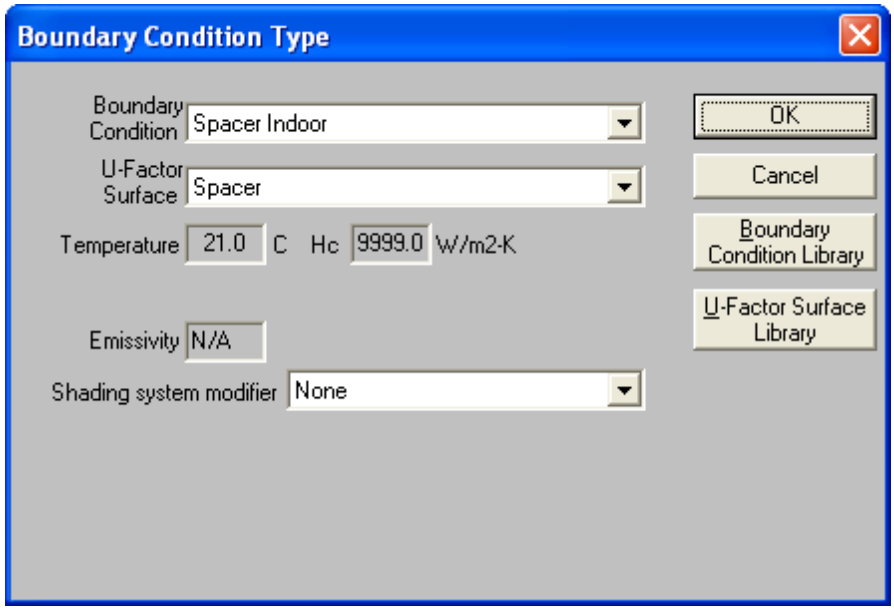
      - Select all segments of the left boundary,
      - Click on "Set Boundary Condition",
      - Select "Spacer Outdoor" from the Boundary Condition and "None" from U-Factor Surface (Tag) choices (drop down menus),



   b. Right vertical segments (all of them, with no exceptions) should be assigned "Spacer Indoor" boundary condition. This boundary condition is also included with the latest installation of THERM 6, and to assign it, do the following:

      - Select all segments of the right boundary,
      - Click on "Set Boundary Condition",
      - Select "Spacer Indoor" from the Boundary Condition and "Spacer" from U-Factor Surface (Tag) choices (drop down menus),

© 2010 National Fenestration Rating Council, Inc.



- Press OK.

9. Save the THERM file.

As opposed to frames, spacer files are saved in their native .thm format and thm files will be read into CMAST. If the spacer is created using three segmented approach, CMAST will be able to do auto-resize into any number of individual sizes. If the THERM model does not contain all three segments (i.e., Left, Middle and Right), only one size will be created from this model.

Spacer model should be drawn with three segments (Left, Middle and Right) whenever possible since it allows for easy and consistent resize. However, there are cases when spacer cannot be drawn with all three segments due to lack of symmetry. Then, the spacer model must contain at least one polygon with assigned Left, Middle or Right segment attribute, and in that case, each individual size needs to be created in THERM 6 as a separate model and imported in CMAST using “Individual Models” option in CMAST spacer component edit screen.

Note that THERM 6 model of spacer whether with three segments or by creating individual models, is identical for both Path II and Path III spacers.

Special Considerations:

Spacer can be resized only if there are no points, in any polygon, in area between Max X coordinate of all polygons tagged as Left Segment and Min X coordinate of all polygons tagged as Right Segment. If this rule is not enforced it is not possible to determine if resizing will result in irregular geometry (overlapping polygons or empty space).

© 2010 National Fenestration Rating Council, Inc.

6. Appendix B: Addendum for Accredited Simulation Laboratories (ASL)

The certified simulator-in-responsible-charge working for an Accredited Simulation Laboratory (ASL) is responsible for generating components and submitting them for approval. In addition to preparing components for review and approval, SIRC/ASL has a role of preparing baseline product for validation (also known as validation simulation data or VSD) and for submitting VSD for framing product line (FPL) validation by IA or NFRC Staff. FPL validation is done by comparing VSD with the validation test data (VTD), which is submitted by testing professional in responsible charge (TIRC), working for accredited testing laboratory (ATL).

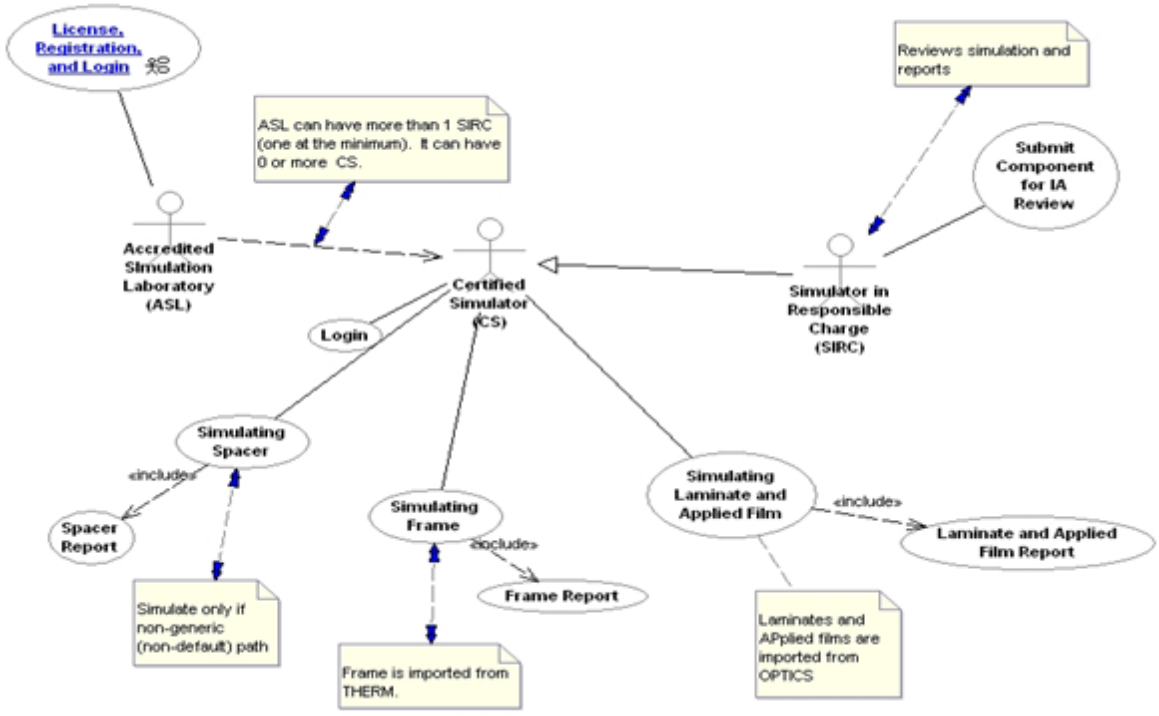
When SIRC logs in to CMAST client, in each detail component screen it has button "Submit for Review" enabled. SIRC can keep component in design mode as long as necessary, but once component is submitted for review, it is locked for further editing and it can be unlocked only if IA rejects component. If IA approves component, it goes into Approved status and is synchronized to all other clients and can be used in label certificates and consequently in certified products. Approved components are permanently locked, and can be only revoked or suspended by IA or NFRC Staff, in which case it is removed from all clients when they perform subsequent synchronization.

Major portion of SIRC/ASL work is in preparing THERM 6 files of frame and spacer components and importing this data into CMAST. For glazing components, SIRC/ASL prepares applied films and laminates in OPTICS, imports therm into CMAST and submits them for review and approval. In addition to submitting components for review and approval, SIRC/ASL is also responsible for generating simulation reports as per NFRC laboratory accreditation program (LAP) guidelines. These reports are prepared and sent to IA outside of CMAST.

© 2010 National Fenestration Rating Council, Inc.

6.1 Accredited Simulation Laboratory (ASL) Process

ASL roles are schematically displayed in the following figure:



Simulator in responsible charge (SIRC), working for an ASL is responsible for submitting components for review and approval and is responsible for submitting validation simulation data (baseline product simulation) for validation. Actions performed in the ASL process are the following:

- Simulators model frame components and spacer components (Path II and III) in THERM 6. See NFRC 100, Section 5.6.4.2 and THERM instructions in Appendix A.
    - Simulator imports THERM data into CMAST when configuring component in CMAST. Process for importing THERM models for frame components is defined in the section on Frame Components, while the process for importing and defining spacer components is defined in the section on Spacer Components. Once information is input for the component and the component performance is calculated, the component is submitted for review to the IA contracted by the manufacturer. Once submitted, component goes in "Review" status and is locked for further editing. Component can be unlocked only if IA or NFRC Staff rejects component, in which case it goes into "Redesign" status and is unlocked for SIRC to make necessary changes.
    - Outside of CMAST, the simulator will send a simulation report for the component

© 2010 National Fenestration Rating Council, Inc.

data modeled per LAP reporting requirements.

- Frame Grouping is done according to the frame grouping rules, as detailed in NFRC 100 Sections 4 and 5.6.4.2.2. SIRC specifies frame components that are grouped using "Define Members" functionality in frame component details screen. Frame grouping details are provided in the section on Frame Components.
- Optics layers – simulator creates laminate and applied film layer in OPTICS per NFRC 303 and 304.
    - Simulator imports this data into CMAST as needed for a specific product(s) in a project, and submits it for IA review, as described in Section Glazing Component.
    - Outside of CMAST, the simulator will send a simulation report with Optics file and manufacturer information, per LAP reporting requirements.
- Frame Validation requirements – see NFRC 100 Section 5.6.5.6. The ASL is required to configure the validation product option in CMAST and submits this option to the IA contracted by the framing manufacturer via CMAST and the framing system product simulation report outside of CMAST per LAP reporting requirements. This process is described in section Baseline Product.

© 2010 National Fenestration Rating Council, Inc.

7. Appendix C: Addendum for ACE

Approved Calculation Entity or ACE is responsible for generating label certificates using approved components. This section will cover the CMA process as it relates to CMAST functionalities for Approved Calculation Entities (ACEs).

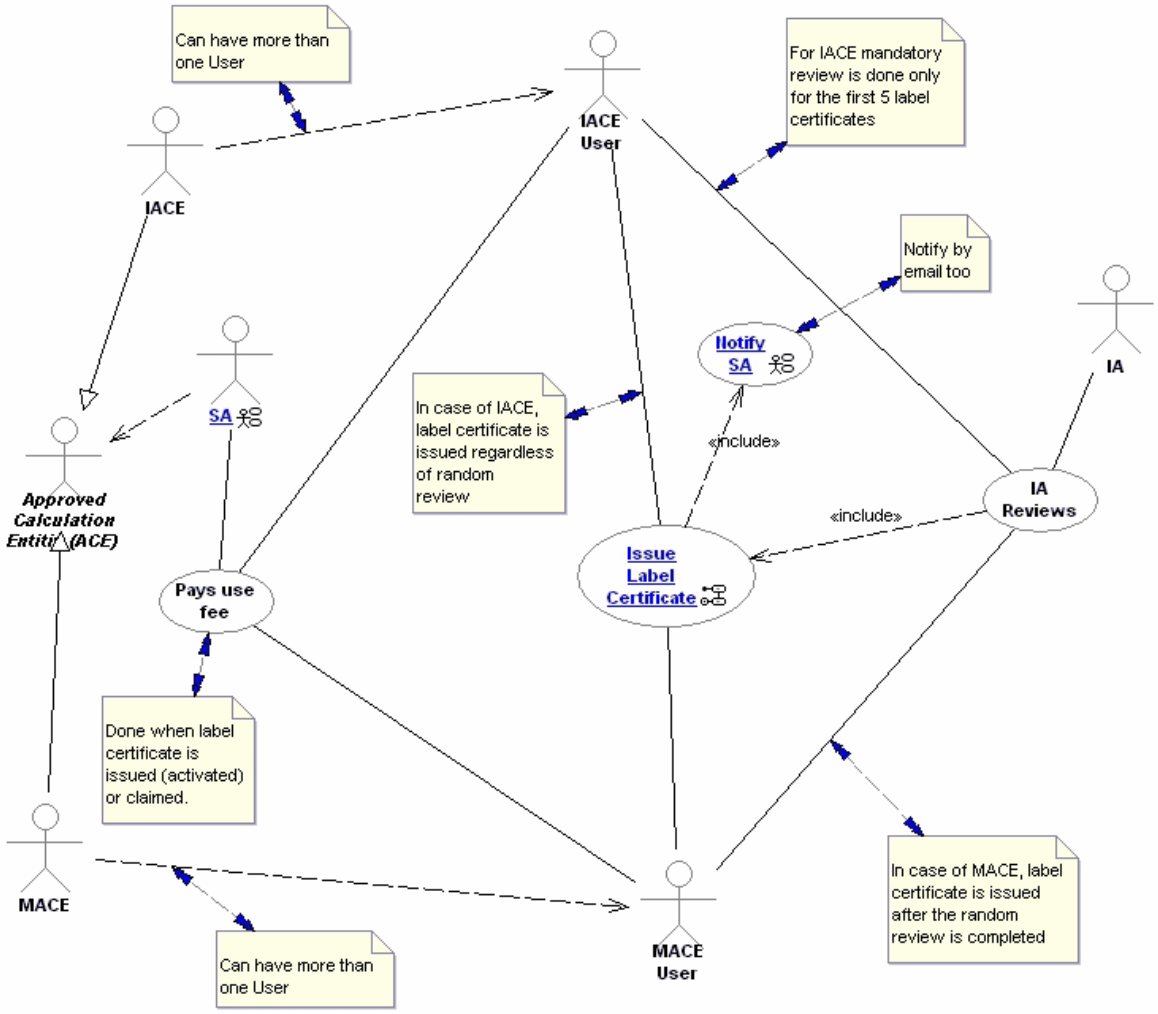
The ACE working for an ACE Organization is responsible for label certificates (LC) and submitting them for approval, if applicable (some LC are subject to mandatory or silent reviews).

When ACE logs in to CMAST client, in project detail screen it has button "Label Certificate" enabled. ACE can keep project in design mode as long as necessary, but once project is submitted for label certificate, it is locked for further editing and it can be unlocked only if IA rejects it (in case of mandatory review). Once project goes into "Certified" status it is permanently locked. Projects and label certificates are not synchronized to all other clients. Label certificates are accessible from the web portal side only. Label certificates can be revoked by NFRC Staff only, although recommendation for revocation can be submitted by an IA. Products that are part of label certificates become certified and they can also be accessed through the web portal.

Major portion of ACE work is in preparing assemblies, products and projects from approved components.

© 2010 National Fenestration Rating Council, Inc.

7.1 Approved Calculation Entity (ACE) Process



NFRC Approved Calculation Entities (ACEs) conduct performance calculations of fenestration product ratings for U-factor, Solar Heat Gain Coefficient, and Visible Transmittance using CMAST. An ACE will operate either as an “Independent” or as a “Manufacturer/Other” ACE.

The difference between the two categories of ACES is that Independent ACEs are subject to NFRC independence requirements per the *NFRC 708-2009: Calculation Entity Approval Program (CEAP)* and Manufacturer/Other ACEs are not. An Independent ACE can work for several difference clients/companies, whereas a Manufacturer/Other ACE is associated with only one company (e.g., framing supplier).

ACEs calculate whole product performance ratings and generate CMA label certificates for a Specifying Authority for products associated with a specified project using CMAST. An ACE will log in to CMAST to define projects, and configure products by accessing NFRC approved components, creating frame, center-of-glass, and spacer edge-seal

© 2010 National Fenestration Rating Council, Inc.

assemblies from these components, and configuring those assemblies into whole products in order to obtain performance ratings for those products.

ACEs are subject to calculation reviews by an NFRC-licensed Certification and Inspection Agency (IA). A percentage of the label certificates they generate will be reviewed by an IA they have contracted with according to the statistical auditing program set forth in the NFRC 708 (see Section 4.3.3).

To qualify as an ACE, an individual must successfully complete a training workshop, pass all required examinations, and obtain a Certificate of Approval from NFRC. Technical competence requirements are set forth in Section 4.1 of the NFRC 708. The Certificate of Approval is granted to an individual, not the organization associated with the ACE (ACE Organization), so the certificate is not conditioned on the ACE being employed by or contracted with a specific ACE Organization.

An ACE creates label certificates (LC) using approved components and generally performs the following steps in CMAST:

- Generates Center of Glazing Assemblies, using approved glazing components
- Generates Gas Mixtures using pure gasses.
- Generates Frame Assemblies (FA) using approved frame components
- Generates Spacer Edge-Seal Assemblies (SESA) using spacer components
- Generates Products from either newly generated COGA, FA, and SESA or from already available assemblies
- Generates Project from either newly generated products or from already available products, defining the project, adding all applicable products in the project, and specifying actual product dimensions and number of products in the project. Note that dimensions and number of products are project-specific and does not affect the original product rated for the project. Selection of representative products is not covered by NFRC procedures, but it is done according to specific energy code requirements.
- Generates label certificate making sure that all required product information for the project has been entered.

© 2010 National Fenestration Rating Council, Inc.

Index

- A -

About 18, 113
Accredited Simulation Laboratory (ASL) Process 149
All Registered Users Visibility 21
Approved Calculation Entity (ACE) Process 152
Assemblies Menu 16
Authentication 11

- B -

Baseline Product 87
Bid Report 95

- C -

Center of Glazing Assemblies 16
Center of Glazing Assemblies List 54
Center of Glazing Assemblies Screen 54
Center of Glazing Assembly Editing 56
Center of Glazing Assembly Screen 56
Change Login Password 100
Client PC Requirements 7
CMAST Options 20
CMAST Support 113
CMASTClientSetup.exe 7
Combination Frame Assembly 68
Common Frame Members 71
Company Billing Pages 129
Company Billing Statements 129
Company Detail Page 109
Company Details Page 107
Company Order Confirmations 129
Company Registration Page 107
Component Fees 127
Components Menu 17
Composite Frame Assembly 71
Creation of Frame Component Model in THERM 136
Creation of New Frame Component 37
Creation of New Spacer Component 46
Creation of Spacer Component Model in THERM 136
Custom Frame Assembly 64

- D -

Default Unit System 20
Doe2 Report 82
Download from Server 24

- E -

Edit User Information 100
EnergyPlus Report 82
Exit 15
External Applications 20

- F -

FC Approval IA 89
Final Installation window 7
Find Billing Statements 111
Find Company 111
Find Company Page 109
Find Frame Component 111
Find Frame Component Page 115
Find Framing Product Line 111
Find Framing Product Line Page 119
Find Glazing Component 111
Find Glazing Component Page 114
Find Label Certificate 111
Find Label Certificate Page 124
Find Notifications 111
Find Order Confirmations 111
Find Person 111
Find Person Page 103
Find Product 111
Find Product Page 120
Find Spacer Component 111
Find Spacer Component Page 117
Find Validation Simulation Data 111
Find Validation Test Result 111
Frame Assemblies 16
Frame Assemblies List 57
Frame Assemblies Screen 57
Frame Assembly Editing 58
Frame Assembly Screen 58
Frame Component Definition - Path I 37
Frame Component Definition - Path II 37
Frame Component Detail Page 115

© 2010 National Fenestration Rating Council, Inc.

Frame Component Edit 37
Frame Component Screen 37
Frame Components 17
Frame Components List 36
Frame Components Screen 36
Frame Group Leader 40
Frame Group Members 40
Frame Grouping 40
Framing Product Line Detail Page 119
Framing Product Line Edit 89
Framing Product Line Screen 89
Framing Product Lines 16
Framing Product Lines List 88
Framing Product Lines Screen 88

- G -

Gas Components 17
Gas Components Screen 52
Gas Mixture 52
Gas Mixture Editing 53
Gas Mixture Screen 53
General Information About Project 93
Glass Details 31
Glazing Component Detail page 114
Glazing Component List 31
Glazing Layer Components 17
Glazing Layer Components Screen 31
Glazing Layer Import from Optics 33

- H -

Help 18
Help Menu 18

- I -

Import From Server 26
Installing window 7

- L -

Label Certificate 16, 97
Label Certificate Fees 127
Last Synchronization Time 20
License Agreement window 7
Links 15
List of Products in Project 94
Login Procedure 11
Logout 15
Lost Password Page 100

- M -

Main Screen 12
Main Screen Areas 12
Main Screen Toolbar 19
Main Scrren Menu Bar 15
Manual 18, 113
My Company Only Visibility 21
Myself Only Visibility 21

- N -

New Center of Glazing Assembly Creation 56
New Company Registration 107
New Frame Assembly Creation 58
New Framing Product Line Creation 89
New Gas Mixture Creation 53
New Product Creation 82
New Spacer Edge Seal Assembly Creation 76
New User Registration 102
New Validation Test Report 113

- O -

Options 18
Options Menu 18

- P -

Participation Fees 127
Password Answer 100
Password Question 100
Payment Data 100
Payment Process 131
Person Detail Page 102, 103
Product Detail Page 120
Product Editing 82
Product Screen 82
Products 16
Products List 81
Products Menu 16
Products Screen 81

© 2010 National Fenestration Rating Council, Inc.

Products Section 94
Program Features 5
Program Overview 5, 12
Project Detail Page 124
Project Edit 92
Project Information Section 93
Project Screen 92
Project Screen Menu Bar 92
Project Screen Toolbar 92
Projects 16
Projects List 90
Projects Menu 16
Projects Screen 90
Pull-Down Menus 15
Pure Gas 52
Pure Gas Screen 52

- R -

Recent Projects 19
Recently opened Projects 16
Register New Company 113
Retrieving Lost Password 100

- S -

Search Functionality 30
Server Login Page 99
Server Main Menu 110
Server Menu Find 111
Server Menu Help 113
Server Menu Home 111
Server Menu Logout 114
Server Menu New 113
Server Menu Switch Units 111
Show Warning Messages 20
Software Usage Fees 127
Spacer Assemblies List 75
Spacer Component Approval Paths 42
Spacer Component Definition - Path I 46
Spacer Component Definition - Path II 47
Spacer Component Definition - Path III 50
Spacer Component Detail Page 117
Spacer Component Edit 46
Spacer Component Screen 46
Spacer Components 17
Spacer Components List 41
Spacer Components Screen 41
Spacer Edge Seal Assemblies 16
Spacer Edge Seal Assemblies Screen 75
Spacer Edge Seal Assembly Definition - Path I 76
Spacer Edge Seal Assembly Definition - Path II 76
Spacer Edge Seal Assembly Definition- Path III 76
Spacer Edge Seal Assembly Editing 76
Spacer Edge Seal Assembly Screen 76
Spacer Series 41
Specify User Visibility 21
Steps to create Projects and Label Certificates 29
Submit Baseline Product for Validation 87
Submit process 28
Switch Units 18
Synchronization 24
Synchronize 18
System Requirements 7

- T -

Topics 113
Types of CMA Fees 127

- U -

Upload to Server 24
User Home Page 100
User Menu 15
User Registration Page 102
User Roles 106

- V -

Validation IA 89
Validation Test Report 122

- W -

Welcome window 7

© 2010 National Fenestration Rating Council, Inc.